THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW.

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THE FOUNDRYMEN'S CONVENTION

A Brief Report of the Annual Meeting of Foundrymen and Exhibition of Foundry Supplies and Apparatus Held at Atlantic City, N. J., September 25 to October 1, 1915.

The holding of the annual meeting of the allied foundrymen's associations, the American Foundrymen's Association, the American Institute of Metals and the exhibition of the Foundry and Machine Exhibition Company, at Atlantic City, N. J., this year more than fulfilled the hopes of the executive committee for a successful event. Both in point of attendance and interest shown at exhibition and professional sessions there was little left to be desired. Blessed with a week of perfect weather and the exhilarating effect of the salt air every one was full of "ginger" and took an active interest in all that happened. The American Institute of Metals held its meetings at the Hotel Traymore while the exhibition and the meetings of the American Foundrymen's Association were held on Young's Million Dollar Pier.

VIEW OF MAIN MACHINERY HALL AT THE EXHIBITION OF FOUNDRY SUPPLIES, YOUNG'S PIER, ATLANTIC CITY, N. J., SEPTEMBER 25 TO OCTOBER 1, 1915.

Here were shown heavy machinery in operation, such as sand mixers, shrapnel lathes and molding machines.

The convention proper opened on Monday, September 27, with registration for both societies on the pier. The meetings of the American Institute of Metals began Tuesday morning, September 28, in conjunction with the American Foundrymen's Association when several papers relating to general foundry practice were read and discussed. These included. Tests of Lenses for Foundry Goggles, by F. W. King; Functions of Sand Binders, by H. M. Lane (this paper is published in this issue of The Metal Industry); Notes on Applications and Characteristics of Cores in Modern Molding, by R. A. Bull; Molding Sands, by C. P. Karr, and Albany Molding Sand, by D. H. Newland.

TUESDAY, SEPTEMBER 28, 2 P. M.

At this meeting, the first session of the American Institute of Metals, the following papers occupied the attention of a goodly percentage of the membership: An Investigation of Fusible Tin Boiler Plugs, by Dr. G. K.

Burgess (a synopsis of this paper appeared in THE METAL INDUSTRY, August, 1915); THE EFFECTS OF THE COMMON IMPURITIES IN SPELTER UPON SLUSH CASTINGS, by G. Rigg and H. C. Morse. This paper is a sequel to the one read by G. C. Stone at the Chicago, 1914, meeting on SPELTER, MANUFACTURE AND PROPERTIES, a portion of which relating to effects of impurities was published in THE METAL INDUSTRY, September, 1915. The conclusions arrived at based upon the experiments described in Mr. Rigg's paper are as follows:

1. Cadmium when present in spelter, produces in it a hot short condition which unfits it for use in castings where power of resistance to cooling stresses is required.

2. Lead when present as an impurity produces an increasingly bad effect upon the alloy. The percentage of failure is greater than with pure spelter, and it produces a tendency toward heavy castings, and hence uneconomical use of metal.

3. The effect of iron in amounts greater than are allowable in spelter, is to increase the tendency to failure. The results are erratic and the trouble is probably due to segregation of crystals of iron-zinc alloy.

4. Arsenic in the amounts in which it occurs naturally in spelter has little or no effect. In larger proportions it acts like iron.

5. Aluminum when present in amounts between traces and 5 per cent produces alloys impossible to use for this purpose. With from 5 per cent. to 5.5 per cent. aluminum the alloy with pure zinc possesses great possibilities because of its lightness, smoothness and general adaptability to this purpose. High grade spelter only must be used, otherwise failure of the casting with time will occur.

6. In general the effect of the common impurities in spelter upon slush castings can be explained by the known physical characteristics of the corresponding alloys.

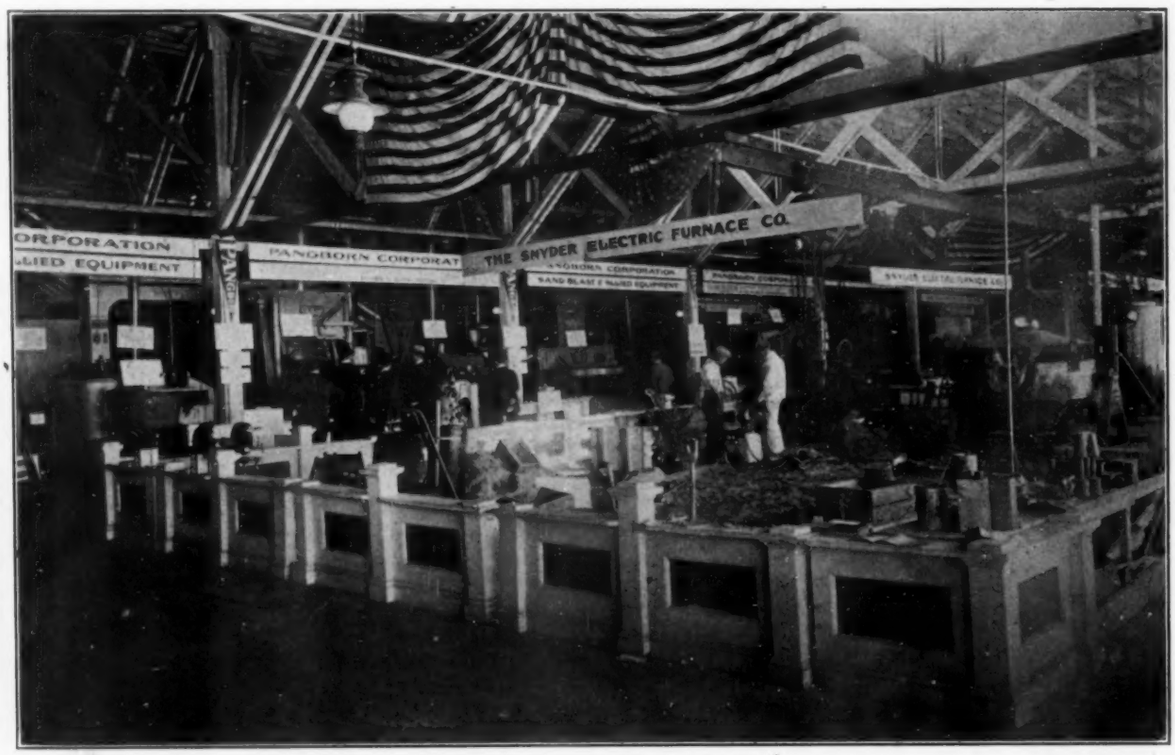
The experiences recited by the members present who took part in the discussion bore out the results stated by the authors of the paper. Some questions asked, however, as to the effect of the impurities in zinc on drawing brass went unanswered, with the exception of cadmium, which a member stated had been found to be the cause of the cracking of leaded brass rods.

STANDARD TEST SPECIMEN OF ZINC BRONZE COPPER 88, TIN 10, ZINC 2. RELATION OF THE MECHANICAL PROPERTIES TO THE MICRO-STRUCTURE, by H. S. Rawdon. This paper is a continuation of the report by the BUREAU OF STANDARDS of work done upon this alloy. A paper by S. L. Hoyt on NOTES ON THE COPPER RICH KALCHOIDS, closed the session. This paper is in general a continuation of one on copper-tin-zinc alloys, by the same author, read at Chicago, September, 1914.

WEDNESDAY, SEPTEMBER 29, 10 A. M.

The first paper of the session was THE EFFECT OF THE PRESENT EUROPEAN WAR ON THE METAL INDUSTRIES, by T. F. Weltstein. This paper explains the reason at the present time for the prices of the metals copper, zinc, tin, lead and antimony. The author predicts that all of the metals mentioned above with the exception of antimony will in the end have been found fairly stable in values. SHERARDIZING, by S. Trood, brought out some discussion as to best practice and causes of failure under varying conditions. The author reviews present practice and predicts that the next step will be a continuous process conducted in vacuum and says that more uniform results with less effort will be obtained.

ALLOYS OF NICKEL, CHROMIUM AND COPPER, by D. F. McFarland and O. E. Harder. The conclusion drawn from the results of experiments described in the paper is: It seems that the alloys of chromium-nickel-copper, which show possibilities of becoming of commercial value, are limited to certain rather well defined ranges of composition. The paper was illustrated by diagrams which showed that the authors' conclusions were well founded.



VIEW OF MACHINERY HALL ANNEX AT THE FOUNDRY SUPPLY EXHIBITION AT ATLANTIC CITY, N. J., SEPTEMBER 25 TO OCTOBER 1, 1915.

Here were shown sand blasts, electric furnace, molding machines, all in operation.

WEDNESDAY, SEPTEMBER 29, 2 P. M.

This session was devoted to the alloys of aluminum and the following papers were read and discussed: ALUMINUM DIE CASTINGS, by Charles Pack. This paper is published in this issue of THE METAL INDUSTRY and gives some very interesting data on the subject of these important castings. THE MANUFACTURE AND USE OF ALUMINO-VANADIUM, by Wm. W. Clark. The author concludes from his investigations that it is very doubtful if small amounts of vanadium will increase the tensile strength of non-ferrous metals beyond that due to its powerful deoxidizing properties. He states that vanadium is a scavenger which unites with the oxygen in the metals and also the nitrogen, but he does not recommend its use for this purpose because of its high cost. He says that there are a number of scavengers just as good and cheaper and

VIEW OF ANNEX HALL AT FOUNDRY SUPPLY EXHIBITION AT ATLANTIC CITY, N. J., SEPTEMBER 25 TO OCTOBER 1, 1915.
Here were installed the exhibits known as "still," consisting of every variety of foundry supplies from metals to shoes.

"If one of these is used to cleanse the metal before adding the vanadium, the vanadium is retained and its full alloying effect is available. Vanadium in small amounts does increase the elongation and I have no doubt that if it were produced and sold at a price that would make it available it would come into general use."

RECENT ADVANCES IN THE MANUFACTURE AND USES OF ALUMINUM AND THE WELDING OF ALUMINUM, by E. V. Pannell, gives a number of interesting facts relating to the conductive and the welding properties of aluminum, and some fluxing compounds, together with photographs of welds, are included in the paper.

ALUMINUM BRONZE ALLOYS, by Wm. M. Corse. This paper gives results of investigations made and the production of commercial aluminum bronze castings by the addition of titanium. A number of illustrations are shown of castings of this alloy now being produced. A paper on MELTING OF ALUMINUM CHIPS, by G. W. Gillet, closed the session; this paper is published in this issue of THE METAL INDUSTRY and is one of the most valuable contributions to metallurgical literature adapted to foundry practice that have appeared for a long time. The information given is most timely, as owing to the present high price of aluminum consumers are at their wits' end to know how to handle the now precious scrap. Dr. Gillet's paper shows the way and we strongly recommend every user of aluminum to carefully read this paper.

THURSDAY, SEPTEMBER 30, 10.00 A. M.

This session was devoted to acid metals and bearing bronzes and the following papers were read and discussed: DEVELOPMENT OF AN ACID RESISTING ALLOY, by S. W. Parr. The author in an investigation of a metal to take the place of platinum evolved an alloy to which he suggests giving the name "Illium" and which has a composition so complex that the analysis of it required the preparation of a paper, METHODS OF ANALYSIS FOR COMPLEX ALLOYS, which gives the details how to analyze Illium. The metal consists of nickel 60.65 per cent., chromium 21.07 per cent., copper 6.42 per cent., molybdenum 4.67 per cent., and small amounts of manganese, silicon, tungsten, aluminum, iron, carbon and boron. THE EFFECT OF CHANGES IN THE COMPOSITION OF ALLOYS USED BY THE AMERICAN RAILWAYS FOR CAR JOURNAL BEARINGS, by G. H. Clamer, is a paper dealing with the effect of zinc on copper-lead-tin alloys, and the author comes to the conclusion that 65 per cent. of copper is the lowest percentage and 5 per cent. of tin is the highest for car bearings. There should be a proper balancing of the four metals, copper, tin, lead and zinc. It is desirable to increase the lead rather than zinc and that alloys carrying approximately 5 per cent. tin, up to 20 per cent. lead, up to 5 per cent. zinc, should be entirely satisfactory for all classes of car journal bearings.

A paper on the ADVANTAGES OF A STANDARD RAILROAD CAR-BEARING ALLOY, by R. R. Clarke, which made a

strong plea for a standard alloy, closed the session. Mr. Clarke gave a remarkable demonstration of memory when he recited his entire paper of 20 pages aided only by a few notes. In his paper he denounces the use of junk and tells of the difficulties encountered by the railroads due to the large number of bearing metal mixtures now in use. He advocates a standard mixture of the following composition: Copper 78 per cent., tin 7 per cent., lead 15 per cent., with room for from ¼ to ½ of 1 per cent. of phosphorus.

THURSDAY, SEPTEMBER 30, 2 P. M.

The last session of the convention was devoted to forging and rolling alloys, and a paper by J. L. Jones on FORGING MANGANESE BRONZE was the first one taken up. This paper is published in this issue of THE METAL INDUSTRY and goes far to explain why so much trouble has been experienced by the engineers of the New York Board of Water Supply and of other cities with manganese bronze. Two other papers dealing with the subject were presented: one by Dr. P. B. Merica, on THE FAILURE OF STRUCTURAL BRONZES, tells of finding initial stresses in samples of bronzes that failed in use, and the other by A. D. Flinn, on EXPERIENCES WITH BRASSES IN CIVIL ENGINEERING WORK, tells of the trouble caused by cracking of various forms of bronzes and brasses used in the Catskill Aqueduct Water Supply. This paper is an amplification of the one presented by Mr. Flinn before the meeting of the Municipal Engineers' Society in New York last November (published in THE METAL INDUSTRY, December, 1914). A paper on STELLITE, an alloy of chromium and cobalt, by Elwood Haynes closed the session.

NEW OFFICERS FOR 1915-16.

The election of officers for the coming year resulted in the unanimous adoption of the ticket presented by the nominating committee which was as follows:

President, J. L. Jones, Pittsburgh, Pa.; Secretary-treasurer, *Wm. M. Corse, Buffalo, N. Y.; vice-presidents, *R. S. B. Wallace, Dayton, Ohio; *G. C. Stone, New York; D. B. Brown, New York; W. B. Price, Waterbury, Conn.; E. H. Barnes, Fort Wayne, Ind.; G. K. Burgess, Washington, D. C.; F. H. Shutz, Decatur, Ill.; D. B. Gullick, Chicago, Ill.; *W. G. Harris, Toronto, Can.; *E. B. Horne, Detroit, Mich.

*Re-elected.

THE ANNUAL BANQUET OF THE ALLIED FOUNDRYMENS' ASSOCIATIONS AND THEIR

REPORT OF SECRETARY-TREASURER.

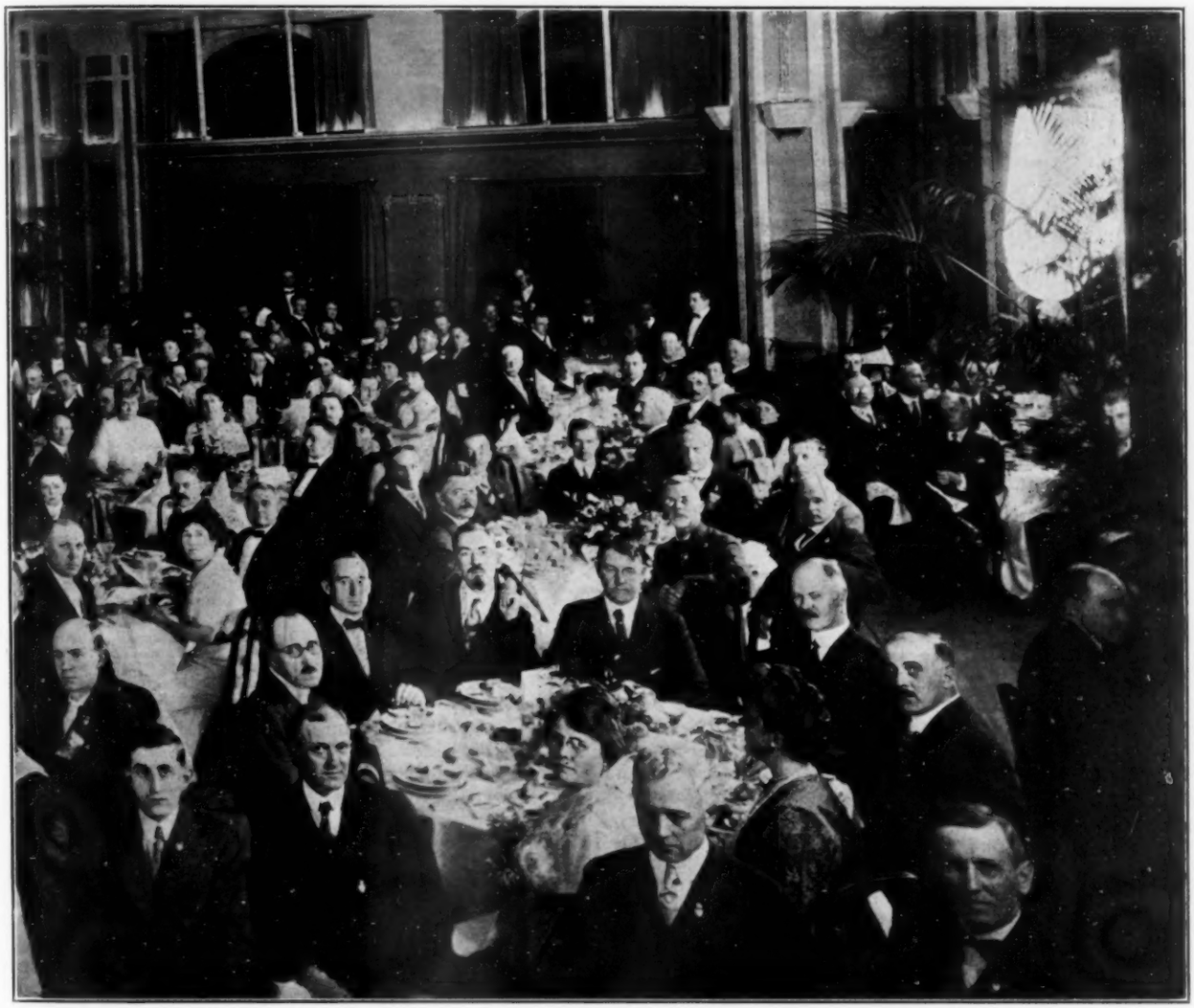
Our membership ending July 1, 1915, was 314. Twenty-two members have resigned and we have received twenty-two applications since July 1, making our total membership to date 314.

The increase in dues has met with a very gratifying response.

One hundred and seventy members have sent in their checks to date, indicating that the bound volume of transactions is worth the amount that we charge for it.

Volume No. 8 has been very favorably received and is without doubt our best volume up to the present time.

Those of us who were fortunate enough to attend the Chicago meeting last year realized the strength of the program and the enormous amount of work done by Dr. Gillett in preparing it. It is, therefore, with a great deal of gratification that I am able to state that this year's program is on the same high plane and bespeaks a lot of work on the part of Mr. Jesse L. Jones, Chairman of the Papers Committee.



FRIENDS HELD AT HOTEL TRAYMORE, ATLANTIC CITY, N. J., THURSDAY, SEPTEMBER 30, 1915.

In the Secretary's work it is also very gratifying to be able to record co-operation of this kind for it certainly is a great help in many ways.

During the year we made an arrangement with Charles Vickers, who is a member of the Publication Committee, to edit the Transactions. As Mr. Vickers is situated conveniently with reference to the Secretary's office this makes a very good arrangement, and I think you will agree that Volume No. 8 bears this statement out.

The co-operative work with the Bureau of Standards has been progressing satisfactorily, a meeting having been held during April of this year with another one planned for October. The papers by men from the Bureau of Standards, presented at this meeting, indicate the scope of the work that the Bureau is undertaking. The members of the American Institute of Metals Committee meeting with the Bureau of Standards feel that the work is well worth while, and are very glad to be able to record the feeling of the Bureau officials to the same effect.

The following is the standing of the books on July 1, 1915:

RECEIPTS AND DISBURSEMENTS FOR YEAR ENDING JUNE 30, 1915.

Receipts.

Cash on hand July 1, 1914	$ 235.06
Dues	1456.00
Volumes	573.10
Interest	2.00
Exchange	.15
Sustaining Membership	305.00
Total	$2571.31

Disbursements.

Printing Transactions, including mailing	$1325.01
Postage	170.12
Office Supplies	66.61
Refund (volume returned)	2.50
Secretary's salary	450.00
Office salary (stenographer)	319.00
Treasurer's Bond	2.50
Insurance Premium	13.20
General Expense	3.30
Exchange	10.75

Express	17.82
Membership Dues	20.80
Convention Expenses (including stenographer)	136.00
Cash on hand July 1, 1915	33.70
Total	$2571.31

AMERICAN FOUNDRYMEN'S 1915 OFFICERS.

The election of officers of the American Foundrymen's Association for the year to come resulted in only two changes from last year. All of the 1914 officers were re-elected with the exception of two new vice-presidents. The officers are as follows: R. A. Bull, president, Commonwealth Steel Co., Granite City, Ill.; A. O. Backert, secretary-treasurer, Twelfth and Chestnut streets. Cleveland, Ohio. Vice-presidents: H. E. Field, senior vice-president, Wheeling Mold & Foundry Co., Wheeling, W. Va.; Henry A. Carpenter, General Fire Extinguisher Co., Providence, R. I.; Walter Wood, R. D. Wood & Co., Philadelphia; S. B. Chadsey, Massey-Harris Co., Ltd., Toronto, Ont.; T. W. Sheriffs, Sheriffs Mfg. Co., Milwaukee; J. P. Pero, Missouri Malleable Iron Co., East St. Louis, Ill.; Alex T. Drysdale, Sheffield Pipe & Foundry Co., Sheffield, Ala.; H. B. Swan, Cadillac Motor Car Co., Detroit, Mich.; A. H. Thomas, Buckeye Steel Casting Co., Columbus, O.; Benjamin D. Fuller, Westinghouse Electric & Mfg. Co., Cleveland, O.

THE FOUNDRY AND MACHINE EXHIBITION

A BRIEF STORY OF SOME OF THE MORE INTERESTING EXHIBITS SHOWN AT ATLANTIC CITY, N. J., SEPTEMBER 25 TO OCTOBER 1, 1915.

Among the displays of the exhibits at the exhibition of the Foundry and Machine Exhibition Company, held at Atlantic City, N. J., September 25 to October 1, which deserves special mention were noticed the following:

The Ajax Metal Company of Philadelphia, Pa., had an intensely interesting exhibit which was of great educational value besides its business aspect. The varied line of ingot metals manufactured by this concern were shown in a very novel and interesting way. First, the cast ingot was shown together with its test bar which had been poured at the same heat as the ingot, then there was a polished slab also from the same heat as the ingot and test bar and finally there were shown the various kinds and forms of castings that had been produced from each special brand of ingot. Some of these castings were of difficult and intricate design, while others more plain, perhaps, made up for it by their size, being either of minute or of gigantic proportions as was evidenced by the castings of manganese bronze ranging from a marine engine cylinder case of 850 pounds to a small casting that only weighed one-half ounce. All of the castings shown by the Ajax people were those made by their customers from ingot metal furnished by the Ajax Company as no castings of alloy metals are manufactured by them.

Another metal concern whose booth was the center of interested attention on the part of the visiting foundrymen was that of White & Brother, of Philadelphia, Pa., who had a number of samples of the fine grades of metal that they produce, a bright red ingot of copper in particular being the subject of inquiry as to what they had used to paint it, while as a matter of fact the ingot was an ordinary one taken at random from a pile of ingots. The little booklet relating to their products which White & Brother handed out was unique in its way, the cover of which was a direct imitation of the SATURDAY EVENING POST.

Another metal producing company whose exhibit attracted much attention was that of the Titanium Alloys Manufacturing Company, manufacturers of bronzes, etc., Niagara Falls, N. Y. These people had some most noteworthy samples of their products and also micrographs of a long line of Titanium-aluminum and bronze castings of a variety of analyses.

S. Birkenstein & Sons, Chicago, Ill., had a most interesting exhibit of ingot brass and bronze, the product of the Globe Metal Company, as well as castings made from these ingots.

The Joseph Dixon Crucible Company of Jersey City, N. J., and the Jonathan Bartley Crucible Company, of Trenton, N. J., had on display what is, at this time, a very valuable product, that is, graphite crucibles for the melting of brass and bronze. The Jonathan Bartley Crucible Company, announced that their crucibles were being manufactured by using a combination of American clays to take the place of German, which is now practically unobtainable, and the results of their investigation were shown in some used crucibles which ran from four heats on steel up to fifty heats on brass and bronze. This is a definite proof that American clay can be used for the manufacture of graphite crucibles and will undoubtedly be good news to the number of users who have been worried over the situation.

The Goldschmidt Thermit Company of New York, N. Y., had a most interesting exhibit in the form of a Thermit weld on a 9 x 3-inch crank shaft. They also showed a number of samples of pure metals and alloys of pure metals that had been produced by the Thermit process.

Herold Brothers Company, Cleveland, O., exhibited various kinds of brushes made by the patented "Electra-Weld" process for wire wheel brushes and this line of brushes attracted considerable attention. They also showed an extensive line of molders brushes made from hair and brass wire.

The Monarch Engineering and Manufacturing Company, of Baltimore, Md., had in their booth a fine line of furnaces which attracted the attention of makers of shrapnel and shells. They also had furnaces for the melting of metals and heat-treatment and a line of core, varnishing and japanning ovens. Their experts were kept busy all day long explaining the various points of interest regarding their equipment.

A most remarkable exhibition of sand blast machinery was noted, the entire field of finishing metals by the sand blast were covered by the several concerns who displayed their equipment. Among these were the Mott Sand Blast Company of Chicago, Ill., the Pangborn Corporation, Hagerstown, Md., the J. W. Paxson Company, of Philadelphia, Pa., the New Haven Sand Blast Company, of New Haven, Conn., the W. W. Sly Manufacturing Company, of Cleveland, Ohio, and the Macleod Company, Cincinnati Ohio.

One of the spectacular features of the exhibit was the electric steel furnace which was installed by the Snyder Electric Furnace Company, of Chicago, Ill. This furnace was poured once a day and the castings from the furnace were cleaned at the various booths exhibiting machinery intended for such purposes. While this furnace was operated at the convention on steel entirely we understand that it is doing equally as good work in the brass and

bronze field, an installation having been made a few months ago at the plant of the Chicago Bearing Metals Company, Chicago, Ill., and reports indicate that it is performing satisfactorily.

Other exhibitors whose booths were interesting from the metal users' standpoint included the Carborundum Company, of Niagara Falls, N. Y., with a complete exhibit of Carborundum and Axolite products, made up into grinding wheels. The Cowan Truck Company, Holyoke, Mass., held the interest of the visitors by means of their ingenious factory trucks.

The Gardner Machine Company, of Beloit, Wis., showed a large number of Gardner polishing and grinding machinery in operation. Stanley Doggett, of New York, N. Y., had a fine exhibit and talked interestingly about foundry facings of all kinds, while Hill & Griffith Company, Cincinnati, Ohio, discoursed about foundry supplies of which their booth was well filled. W. R. Parsons, of Chicago, Ill., gave an eloquent description of his metal polishing process. The Malleable Iron Fittings Company, Branford, Conn., made themselves heard and put Branford on the map by their exhibit of electric vibrators for molding shops and also had an exhibit of valves and fittings.

The J. S. McCormick Company, Pittsburgh, Pa., showed a new sand mixer in addition to a variety of other devices for the foundry. S. Obermayer Company, Chicago, Ill., had an extensive and interesting line of foundry supplies, tools, and equipment which were shown by cuts and photographs. R. P. Smith & Sons, Chicago, Ill., interested a great many people with their safety shoes for foundries and shops. The Sterling Wheelbarrow Company, of Milwaukee, Wis., exhibited a new line of ribbed channel steel foundry flasks and also had an ample supply of steel wheelbarrows and carts, together with maple wedges and skim gates. The Wyoming Shovel Works, Wyoming, Pa., contented themselves with a unique exhibit of shovels and scoops and the Whiting Foundry Equipment Company, Harvey, Ill., and the E. J. Woodison Company, Detroit, Mich., had extensive exhibits of foundry equipment, supplies and also plating supplies.

THE EXHIBITORS

A List of the Exhibitors at Atlantic City, N. J., and What They Exhibited.

AJAX METAL COMPANY, Philadelphia, Pa.
Metals and Alloys.

ARCADE MANUFACTURING COMPANY, Freeport, Ill.
Molding Machines.

E. C. ATKINS & CO., INC., Indianapolis, Ind.
Saws for Metals.

AYER & LORD TIE COMPANY, Chicago, Ill.
Wood Blocks for Floors.

JONATHAN BARTLEY CRUCIBLE COMPANY, Trenton, N. J.
Crucibles.

BERKSHIRE MANUFACTURING COMPANY, Cleveland, O.
Molding Machines.

CHAS. H. BESLY & CO., Chicago, Ill.
Grinders of all kinds.

S. BIRKENSTEIN & SONS, Chicago, Ill.
Metals.

BLYSTONE MANUFACTURING COMPANY, Cambridge Springs, Pa.
Sand Mixers.

BROWN SPECIALTY MACHINERY COMPANY, Chicago, Ill.
Core Machines and Sand Blast.

BUCH FOUNDRY EQUIPMENT COMPANY, Bridgeport, Pa.
Molding Machinery Cranes, Flasks, etc.

BUCKEYE PRODUCTS COMPANY, Cincinnati, O.
Foundry Supplies.

CARBORUNDUM COMPANY, Niagara Falls, N. Y.
Abrasive Compounds.

CATARACT REFINING & MANUFACTURING COMPANY, Buffalo, N. Y.
Core Compounds and Oils.

CHARLES J. CLARK, Chicago, Ill.
Blast Meter.

GEORGE P. CLARK COMPANY, Windsor Locks, Conn.
Transfer trucks.

CLARK FOUNDRY COMPANY, Rumford, Me.
Punch and Shear.

CLEARFIELD MACHINE SHOPS, Clearfield, Pa.
Wet Pan for Grinding.

CLEVELAND AUTOMATIC MACHINE COMPANY, Cleveland, O.
Automatic Machine.

CLEVELAND PNEUMATIC TOOL CO., Cleveland, O.
Air Tools for Foundries.

CLIPPER BELT LACER COMPANY, Grand Rapids, Mich.
Clipper Belt Lacing.

THOS. E. COALE LUMBER COMPANY, Philadelphia, Pa.
Pattern Lumber.

COWAN TRUCK COMPANY, Holyoke, Mass.
Trucks.

JOSEPH DIXON CRUCIBLE COMPANY, Jersey City, N. J.
Crucibles and Graphite Products.

FELT & TARRENT MANUFACTURING CO., Chicago, Ill.
Comptometers and Calculagraphs.

FOUNDRY MANGANESE COMPANY, Philadelphia, Pa.
Manganese Products.

GARDNER GOVERNOR COMPANY, Quincy, Ill.
Governors.

GARDNER MACHINE COMPANY, Beloit, Wis.
Grinders.

GENERAL ELECTRIC COMPANY, Schenectady, N. Y.
Electrical Machinery.

GOLDSCHMIDT THERMIT COMPANY, New York City.
Thermit Welds and Metals.

GRACETON COKE COMPANY, Graceton, Pa.
Coke.

GREAT WESTERN MANUFACTURING COMPANY, Leavenworth, Kan.
Gyratory Foundry Riddles.

F. A. HARDY & CO., New York City.
Noviweld Eye Glasses.

HAYWARD COMPANY, New York City.
Buckets for Hoists.

HERMAN PNEUMATIC MACHINE CO., Zelienople, Pa.
Pattern, Drawing and Strippers.

HEROLD BROS. COMPANY, Cleveland, O.
Wire Wheel Brushes.

HILL & GRIFFITH COMPANY, Cincinnati, O.
Foundry Supplies.

INGERSOLL-RAND COMPANY, New York City.
Air Compressors and Drills.

INTERNATIONAL MOLDING MACHINE CO., Chicago, Ill.
Molding Machines.

INTERNATIONAL STEAM PUMP CO., New York City.
Sand Riddlers.

JENNISON-WRIGHT COMPANY, Toledo, O.
Wood Block Floors.

JULIUS KING OPTICAL COMPANY, Chicago, Ill.
Safety Eye Glasses.

LANDIS TOOL COMPANY, Waynesboro, Pa.
Grinding Machinery.

LEHIGH COKE COMPANY, South Bethlehem, Pa.
Coke Products.

LINCOLN ELECTRIC COMPANY, Cleveland, O.
Arc Welders.

DAVID LUPTON'S SONS COMPANY, Philadelphia, Pa.
Steel Sashes.

YOUNG'S MILLION DOLLAR PIER AT ATLANTIC CITY, N. J., WHERE THE 1915 FOUNDRYMEN'S CONVENTION WAS HELD THE WEEK OF SEPTEMBER 25 TO OCTOBER 1, 1915.

J. S. McCORMICK COMPANY, Pittsburgh, Pa.
Sand Mixer.

THE MACLEOD COMPANY, Cincinnati, O.
Sand Blasts and Portable Heaters.

MALLEABLE IRON FITTINGS CO., Branford, Conn.
Vibrators, Valves and Fittings.

THE METAL INDUSTRY, New York City.
Books.

MIDLAND MACHINE COMPANY, Detroit, Mich.
Molding Machines.

MONARCH ENGINEERING & MANUFACTURING COMPANY, Baltimore, Md.
Furnaces.

MOTT SAND BLAST MANUFACTURING CO., Chicago, Ill.
Sand Blasts.

E. H. MUMFORD COMPANY, Elizabeth, N. J.
Molding Machines.

MUMFORD MOLDING MACHINE COMPANY, Chicago, Ill.
Molding Machines.

NATIONAL ENGINEERING COMPANY, Chicago, Ill.
Sand Mixers.

NEW HAVEN SAND BLAST COMPANY, New Haven, Conn.
Sand Blasts.

NORMA COMPANY OF AMERICA, New York City.
Bearings.

NORTON COMPANY, Worcester, Mass.
Abrasives.

S. OBERMAYER COMPANY, Chicago, Ill.
Foundry Supplies.

OSBORN MANUFACTURING COMPANY, Cleveland, O.
Molding Machines.

OXWELD ACETYLENE COMPANY, Chicago, Ill.
Welding Machines.

PANGBORN CORPORATION, Hagerstown, Md.
Sand Blasts.

J. W. PAXSON COMPANY, Philadelphia, Pa.
Foundry Supplies.

PICKANDS, BROWN & CO., Chicago, Ill.
Solvay Coke.

HENRY E. PRIDMORE, Chicago, Ill.
Molding Machines.

READY TOOL COMPANY, Bridgeport, Conn.
Stellite Tools and Belt Shifters.

RICHEY, BROWNE & DONALD, INC., Maspeth, N. Y.
Molding Machines.

ROBESON PROCESS COMPANY, New York City.
"Glutrin" Core Compound.

SAND MIXING MACHINE COMPANY, New York City.
Sand Mixer.

SHEPARD ELECTRIC CRANE AND HOIST COMPANY, Montour Falls, N. Y.
Cranes and Hoists.

W. W. SLY MANUFACTURING COMPANY, Cleveland, O.
Sand Blasts and Tumbling Devices.

R. P. SMITH & SONS, Chicago, Ill.
Foundry Shoes.

SNYDER ELECTRIC FURNACE COMPANY, Chicago, Ill.
Electric Furnace.

STANLEY DOGGETT, New York City.
Foundry Supplies.

STERLING WHEELBARROW COMPANY, Milwaukee, Wis.
Foundry Flasks.

W. F. STODDER, Syracuse, N. Y.
Sand Blast Nozzle.

STRONG, KENNARD & NUTT COMPANY, Cleveland, O.
Glasses and Goggles.

SULLIVAN MACHINERY COMPANY, Chicago, Ill.
Compressors.

TABOR MAUFACTURING COMPANY, Philadelphia, Pa.
Molding Machines.

TITANIUM ALLOY MANUFACTURING COMPANY, Niagara Falls, N. Y.
Titanium Bronze and other alloys.

UNITED STATES GRAPHITE COMPANY, Saginaw, Mich.
Graphite.

WATERBURY WELDING COMPANY, Waterbury, Conn.
Foundry Riddles.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, East Pittsburgh, Pa.
Arc Welding Machine.

WHITE & BRO., INC., Philadelphia, Pa.
Metals.

WHITING FOUNDRY EQUIPMENT CO., Harvey, Ill.
Foundry Machinery.

T. A. WILLSON COMPANY, Reading, Pa.
Glasses.

E. J. WOODISON COMPANY, Detroit, Mich.
Foundry Supplies.

T. B. WOOD'S SONS COMPANY, Chambersburg, Pa.
Molding Flask.

WYOMING SHOVEL WORKS, Wyoming, Pa.
Shovels and Scoops.

HOW TO REDUCE MACHINE FRICTION

By N. G. Near.

Wherever there are machines, there is friction. friction usually consumes most of the power that is developed and transmitted. Look through your own plant carefully and you will soon discover that most if not all of the power is thus lost. Some of the friction is useful. The rest is useless. That that is useless should be cut down as much as possible.

Take, for instance, the belting and line shafting. Each bearing and each belt is a sort of "nest" of friction. This friction should be reduced as much as practicable. There is an economic limit, for it certainly won't pay to make every bearing a ball bearing just because ball bearings consume less power than do the commoner types. Ball bearings are expensive and should not be used in places where the saving in power would amount to less than the interest charges on the first cost, plus the cost of depreciation. All of these factors must be considered before the expensive ball bearings are installed.

Where a bearing transmits considerable power, year in and year out, and where it can be computed with actual figures that it will PAY to install a ball bearing there, why then, of course, a ball bearing should be installed. Main shaft bearings are responsible, usually, for the loss of much power. They are generally responsible for the transmission of all the power that comes from the engine or motor. Hence, I would say, look to your main bearings first. Before installing any new apparatus, though, are you sure that you cannot better the transmission in your shop WITHOUT the new equipment? Perhaps you can. And after you do, it is quite possible you will want something better, anyway. In any event, it does no harm to try to do the best you can with the machinery you now have on hand before making any changes.

A good way to test the friction load on an engine or motor, a method that does not involve the use of expensive testing machinery or instruments, a method that is so simple that it should be used very often by every operator of shop plants, is as follows: Just pull out your watch and take the time required for your machinery to come to a dead stop after steam or electric power is shut off. Isn't that easy? To explain the test fully, consider the flywheel of a large Corliss engine which runs at the rate of 75 r. p. m. That flywheel has a definite weight and contains a definite amount of stored energy while it is running. No matter what year, what month, what week, day, hour, minute or second the flywheel is running it contains exactly "so much" energy while running at the normal rate of 75 r. p. m.

Therefore, when you shut off the steam, the flywheel is going to keep on running for a short time. How long it will run I cannot tell, nor can you tell without timing it, as it all depends upon that thing which we are now discussing—friction. If your machines are running under full load it may stop in a minute or less. If your machines are running "empty" it may take two minutes or more for the flywheel to come to rest. If the friction is very great the wheel may come to rest in half a minute, and if the friction is really small, it may require four or five minutes for the engine to come to a stop. So, it is plain that friction has about everything to do with the length of time required for the machinery to come to a stop after the propelling medium is shut off, whether it be steam or electricity. To be sure, the weight of the flywheel also has much to do with it, but in the end the results are the same anyway, no matter what the weight. In making this test it is best to try it with machines running "empty" because then conditions are more liable to be the same every time the trial is made.

Thus, on the first day, let us assume that the time required to come to a stop with machines empty is exactly two minutes. Changes are then made in the transmission equipment. The belts are given attention, bearings are cleaned and oiled, wherever babbitting is necessary the bearings are babbitted, shafting is aligned properly, and in every way possible the friction is reduced. The next time the test is made it takes two minutes and a half to stop. This indicates a very good improvement and the betterment has cost nothing outside of a little work, babbitt, and oil. Nothing NEW has been bought or added.

Now, after all improvements possible have been made in this way, after the stopping time has been made as GREAT as it can be made with machines running empty, the owner or whoever is in charge can decide whether or not it might be worth while to equip some of the principal bearings with ball bearings or in other ways improve transmission with new apparatus. If the stopping time cannot be INCREASED there is no argument in favor of ball bearings, but if such bearings do increase the stopping time and increase it sufficiently, it may be good business to install them. Judgment must always be used as well as this test. It is not necessary that all improvements be made in a single day. Keep on bettering the transmission every day for a month, two months, or a year. Begin an efficiency crusade of your own. At the end of that time you will doubtless find that the stopping time has increased considerably, and you can thereupon conscientiously stick a new feather in your cap.

I speak of flywheels throughout because it is easiest to think and talk about flywheels. But the body that stores the energy needn't necessarily be a flywheel. The rotors in steam turbines usually keep the turbines a-running for a long time after the steam is shut off—sometimes for hours. Large motors also keep on running for some time after the current is thrown off. Whatever the form of motive power the above arguments hold. It makes no difference. If, for instance, it is desired to merely test the efficiency of the engine itself, this method will do the trick very nicely. Make the stopping time as long as possible. This makes for greatest transmission efficiency; least friction; most power; least waste; greatest output.

THE MANUFACTURE AND USES OF WROUGHT MANGANESE BRONZE*

AN EXPLANATION FOR THE FAILURE OF SOME BRONZES USED IN ENGINEERING PRACTICE.

BY JESSE L. JONES.

Manganese bronze when introduced into the United States from England about 1893, found its first important application in the manufacture of propeller blades because of its strength and toughness and the fact that it is practically incorrodible in sea water. The low melting point of the cast manganese bronze and the ease with which it can be cast into the most intricate forms led to its adoption for many automobile parts and numerous other applications where service conditions are extremely severe.

The rolling and forging grades of manganese bronze had at first very few applications. The greater cheapness of the cast manganese bronze, its remarkable uniformity and excellence and the fact that there was so little difference between it and the hot rolled grades as to physical characteristics, discouraged the use of wrought manganese bronze in many quarters.

As a rule, however, designing engineers consider forgings more reliable than castings, and they ascertained also that wrought manganese bronze has much greater strength and ductility than yellow brass, Muntz metal, Tobin bronze, etc. Hence forged manganese bronze began to be used in various water supply and irrigation projects. Forgings over three and three-quarters inches in diameter, more than 20 feet long and weighing over 900 pounds have been successfully made.† There is no record that any of these forgings have proved unsatisfactory or have failed in service.

Other applications are for piston rods, shafting, axles, etc., for machinery to be used in mines where there is corrosive water, or on shipboard for turret parts in connection with gun mounts, ordnance attachments, etc., where the metal must resist corrosion by sea water. A very soft, tough grade is used for sheet metal which has found application in the hulls of racing yachts, staybolts for locomotives and other bolts that must resist shock or the effect of repeated stresses.

Extruded manganese bronze blades have found some application in steam turbine construction where the erosive action of high pressure steam is very severe. A large amount of wrought manganese bronze is used by powder and explosive manufacturers in situations where strength and non-corrosiveness is demanded, or where the use of steel would be dangerous by reason of its giving off sparks when struck.

Composition—Wrought manganese differs chiefly from the casting grade in being free from aluminum. The addition of aluminum enables the alloy to be cast satisfactorily in sand molds. The following specifications as to composition may be considered as representative of the manganese bronze alloys most generally used:

Grade	No. 1 A (for bars)	No. 1 B (for sheets)	No. 2 (for sand castings)
Aluminum	nil	nil	.15
Copper	57.35	58.15	56.00
Iron	1.40	.75	1.40
Lead	.03	.03	.03
Manganese	.02	.02	.12
Tin	1.20	.45	1.05
Zinc	40.00	40.60	41.25

* A paper presented at the Annual Meeting of the American Institute of Metals, September 28 to October 1, 1915, at Atlantic City, N. J.

† Some forged manganese bronze valve stems were described in THE METAL INDUSTRY for March and October, 1911, that weighed upwards of 3,000 pounds apiece.

PURE METALS NECESSARY.

In order to secure ductility as well as high tensile strength, extreme purity of the materials used is absolutely essential.

The grade of copper used in England is known as "Best Selected." It is of good quality, except that it contains antimony and arsenic, which harden and lower the ductility of any alloy in which the copper is used.

In the United States, opinion as to which is the best grade of copper, is somewhat divided. Non-arsenical Lake copper is usually preferred for particular work because of its uniformity in quality, although the best grades of electrolytic copper are of equal analytical purity. The impurities usually present are as follows:

COPPER ANALYSIS.

	"Best Selected"	"Lake"
Antimony	.019	nil
Arsenic	.023	nil
Copper	99.895	99.881
Copper suboxide	trace	.112
Iron	.056	.004
Lead	nil	trace
Silver	.007	.003
Sulphur	nil	trace

In the manufacture of manganese bronze the selection of a pure grade of zinc is perhaps more important than any other one consideration. Freedom from lead is essential, as lead oxidizes readily and makes drossy, brittle metal. Absolutely pure zinc would be an ideal material, and while it can be and has been produced commercially, its high cost has militated against its use. Dr. Jos. W. Richards made several tons of electrolytic zinc a few years ago in Philadelphia, but no market could be found for it.

A very pure zinc is produced in Eastern Pennsylvania from a willemite or silicate of zinc ore. The concentrate used contains garnet, rhodocrosite, red oxide of zinc and Franklinite. The ore will average 49.26% zinc and 3.50% manganese. The slab zinc is marketed under various names, and it produces a manganese bronze of remarkable strength and ductility.

A zinc of almost equal purity is produced by the double distillation of galvanizer's dross, the slabs being skimmed just before setting so as to remove any impurities that rise to the surface. While there is little difference in the analysis of zinc made from willemite and that made from dross, the former has the greater toughness and strength. Perhaps this is due to the manganese in the ore. At any rate, if samples of the two grades of zinc of almost identical analysis are cast into slush molds, the one casting is liable to crack and the other will not. For this reason, makers of intricate slush zinc castings are compelled to use the willemite zinc. A number of the makers of high-grade zinc use the slush mold as a means of testing their product, and it will be found a very satisfactory way of testing zinc to be used for making manganese bronze.

The ordinary grades of spelter, known as "Prime Western," are high in lead and for this reason should never be used. Scrap zinc reclaimed from sheet, etc., is also poor material. It may be high in lead and tin because of having been soldered, or it may contain

much cadmium, which element has a hardening effect on manganese bronze. The grade of spelter used in England in conjunction with "Best Selected" copper is a French spelter known as Font-d'Art.

The following analyses indicates the composition of the grades of zinc discussed above:

SPELTER ANALYSES.

	Font-d'Art	Electro-lytic.	Wille-mite.	Dross.	P.W.	Scrap.
Aluminum.	.....	.0005	nil	nil	nil	.....
Antimony..	.....	nil	nil	nil	trace	.....
Arsenic ...	.....	nil	nil	nil	trace	.....
Cadmium..	.123	nil	.002	nil	.024	.003
Copper ...	trace	.0120	.001	nil	.001	.060
Iron	.020	.0003	.003	.009	.024	.030
Lead	.135	.0193	.039	.057	1.448	2.050
Silica	.....	.0009	nil	nil	trace	.....
Tin	.....	nil	nil	nil	nil	1.410
Zinc	99.718	99.9670	99.955	99.934	98.503	96.447

MELTING.

Crucibles are generally used for making forging manganese bronze, the heats being 325 pounds each and requiring a No. 125 crucible. More recently there has been a tendency to use a No. 300 crucible, as the smaller crucibles limit the output. Another reason for using the larger crucibles is that when a number of furnaces are attached to the same stack there are variations in the draft and it is seldom that any two crucibles can be brought out at the same temperature.

The copper is first melted, then superheated, keeping it carefully covered with charcoal all the while. Next the iron and manganese additions are made from a small crucible in which they have been separately melted. Finally the zinc is added, a little at a time, with constant stirring, and the alloy poured into ingots for melting. The remelting is considered necessary to secure a more uniform distribution of the iron and manganese. If the initial temperature of the copper is not high enough, or if the zinc is added too rapidly, the iron addition is thrown out of solution to a greater or less extent and is found disseminated through the ingots in the form of small shot, which are practically high carbon tool steel. These shots will knock the edge from a machining tool in a few minutes and cause cracks in a forging when it is stressed. The composition of these shot is indicated below:

Aluminum	nil
Carbon, combined	4.34
Carbon, graphitic	.66
Copper	3.82
Iron	89.44
Manganese	trace
Phosphorus	.010
Silicon	trace
Sulphur	.020
Tin	.110
Zinc	.870

It is not difficult to obtain a uniform alloy, however, if due regard is had to the temperature of the copper. The copper must not only be hot, but very hot, as it is much easier to make bad metal by underheating than by overheating. Where the ingot metal is remelted for pouring into slabs or billets, reverberatory furnaces can be used if intelligently handled.

The only entirely satisfactory method of melting manganese bronze is in the open flame, oil-fired type of furnace. The melting loss is low, the additions can be thoroughly alloyed and the metal poled and worked so that remelting is entirely unnecessary and the metal can be poured into billets at once without the usual double melting loss. Large heats up to 20,000 pounds can be made and the resulting economy is considerable.

POURING.

The removal of dross from manganese bronze that is poured into slabs may be accomplished by skimming the slabs just before the metal solidifies.

In making large ingots, a crucible with a hole in the bottom, may be set on top the ingot mold and by keeping the crucible partly filled with molten metal, the entrance of dross is prevented. When the metal is poured, there should be as little drop as possible, for a long drop results in forming much dross. Hence, ingots should be short and thick if possible. Bottom pouring would be a good thing, only it would give cold metal at the top of the ingot and result in the formation of long pipes. With care a discard of only 2% from the top of the ingots is possible. As the surface of the ingots is liable to be rough and full of cold-shuts, the ingots must be overhauled or rough turned before forging or rolling in order to avoid blister or slivers in the finished product. The pouring temperature of the bronze must not be too high or it will cut the molds and become contaminated in this way with cast iron.

In time the ingot molds become coated with a layer of metallic zinc mixed with zinc oxide, which has sublimed from the red-hot ingots and condensed on the face of the molds. Unless this deposit is removed by scraping the molds or heating them to a red heat in an annealing furnace, the quality of the ingot metal soon deteriorates. The zinc seems to diffuse through the ingot in a remarkable manner, possibly being deposited along the margins of the crystal grains in the form of metallic zinc and makes the bronze less ductile. At times, too, this layer of zinc on the mold will produce such a volume of zinc vapor when the bronze is poured that the ingot is full of blow-holes.

FORGING.

Manganese bronze can be readily forged, drop-forged, rolled, or extruded at a red heat. The physical characteristics will depend on the finishing temperature. The material hardens rapidly when worked cold, and machinery designed for the cold rolling and drawing of Tobin bronze, Muntz metal and yellow brass is not usually powerful enough to handle manganese bronze properly. This may result in the exterior of an article being overstrained, while the interior is soft and comparatively unwrought. Excessive cold work on manganese bronze makes it glass hard and it may even become full of hair cracks and incipient fissures, invisible to the eye, but capable of being shown by stressing. An infallible test for excessive cold work on material otherwise of good quality is the appearance of the fracture of a test piece. If cup-shaped or lipped like the fracture of a soft steel specimen, assurance may be had that the manganese bronze has been given the proper heat and forging treatment. If, however, the fracture is conchoidal and irregular, excessive cold work without proper annealing is indicated.

OTHER GRADES OF FORGING MANGANESE BRONZE.

As the number of firms making manganese bronze has increased, there has been more or less competition for the business available and the quality of the metals used in the bronze has not always been as high as it should be. This has resulted in lessened ductility. Another cause for this fault is the desire for a higher tensile strength on the part of some designing engi-

neers. To meet this demand, manufacturers have resorted to various plans which gave bronze of a higher tensile strength and elastic limit, but always with less ductility.

One manufacturer uses the casting grade of bronze, melts in an open flame furnace and poles the metal until a part of the zinc is removed and much of the dross and dirt. This gives an extremely clean and tough metal for sand castings, but it is not especially suitable for forging, as there is always some entangled alumina in the bronze that cannot be removed and which may cause defects. Further, this grade of bronze hardens too rapidly when hammered, and hair-cracks are nearly always present in the finished forging unless unusual care is observed.

Another maker uses one-half casting mixture and one-half forging mixture with the addition of a little extra manganese. A tensile strength of over 90,000 pounds is thus secured, but the objections noted above hold good also for this mixture.

Other manufacturers have increased the aluminum by several per cent. of the manganese or both, and have made additions of vanadium, titanium, etc., obtaining in this way a tensile strength as high as 125,000 pounds per square inch, but with an elongation that is seldom more than 20%.

Any radical departure from the formulas given in the first part of this paper or the use of any but the purest materials can only result in inferior manganese bronze. Safety is not found in extremely high tensile strength, but in great ductility and in avoiding excessive cold working. A tensile strength of say 70,000 pounds should not be exceeded. Great ductility allows more leeway in forging, but cold work is always objectionable, as it may result in hidden ruptures or later on in the so-called "season cracking." No manganese bronze, however ductile; in fact, no wrought non-ferrous alloy whatever can be said to be able to safely withstand excessive cold work that strains it above the elastic limit.

The future should see a more extended use of wrought manganese bronze. Its physical characteristics warrant a wider field for it. If those who manufacture it make quality the first consideration and if those who use it specify it intelligently, it will find a wide application.

ALUMINUM DIE CASTING A COMMERCIAL ACHIEVEMENT*

A Description of Successful Attempts to Produce These Castings.

By Chas. Pack.†

The writer (in his paper before this Institute, in September, 1914) has outlined the present status of the die casting industry. The past year with its war and unparalleled metal conditions has forced the die casting industry to fight for existence amongst the metal trades.

As shown by the writer, none of the die casting alloys in general use (zinc, tin or lead base) exceed cast iron in tensile strength. It can therefore be seen that the foundation of the die casting industry must be based on the word "Economy," by which is meant that the cost of any die casting must be less than the combined cost of producing that casting in cast iron and machining to a finished product equivalent to a die casting. It will be readily seen that the cost of metal must be a vital factor to the life of the die casting industry since prohibitive prices for raw materials must exclude die casting from competition with other methods of production. The zinc market may serve as a good illustration. As shown by the writer in 1914, approximately 85 per cent. of the die castings produced were made from zinc alloys consisting of a minimum of 85 per cent. zinc, the other elements, being tin and copper, which having a higher market value would tend to raise the net cost of the average zinc die casting alloy to approximately 5 cents per pound above the market price of zinc. For example, with zinc at 7 cents, copper at 16 cents and tin at 40 (which prices are about the average) the cost of the average die casting alloy is 12 cents per pound. This means that in order to compete with sand casting the die casting process must show a minimum saving of about 9 cents per pound on the machining cost of the casting since the cost of cast iron does not exceed three cents per pound. The cost of zinc (intermediate brand) on June 1 was 28 cents per pound, which would bring the cost of the average die casting alloy to 31 cents per pound. What this high metal cost means to the die casting industry can readily be understood by considering the fact that in order to compete, a three-pound die casting must show a net saving on machining cost of at least 84 cents. Although there are numerous instances where die castings show a saving even at this high market, the growth of the industry must of necessity be curtailed if such conditions are to prevail unless a substitute for zinc is to be found. A careful study of the properties of the common metallic elements reveals aluminum as the "hope" of the die casting industry. The normal price of aluminum before the war was 8 cents, which (considering the specific gravity) makes it the cheapest non-ferrous metal obtainable and with aluminum at 35 cents per pound, it exceeds only lead in cost.

With the foregoing facts in view, it is not surprising that the die casting manufacturers should find it necessary to make a desperate attempt to produce aluminum die castings commercially.

It has been claimed at various times that aluminum die castings were being produced in France and Germany. The writer personally investigated the claims of one individual who had just come from France, where he had discovered the "secret process" for die casting such parts as automobile crank cases, transmission gears and, in fact, any part from the size of a pin to the size of a large writing desk. This claim as well as many others were found to be without foundation and the writer has generally found that the term "die casting" was misconstrued. The practice of inserting iron parts in a sand mold at certain points to save machining, is not new, but this does not constitute die casting, by which is understood the process of pouring molten metal (under pressure) into a permanent metallic mold producing castings requiring little or no machining before assembling.

That die casting is an individual industry originated in this country, is proven by the fact that licenses under the "Doehler Process," patented by Mr. H. H. Doehler, were sold in England, Germany, Austria-Hungary,

* A paper presented at the Annual Meeting of the American Institute of Metals, September 28 to October 1, 1915, at Atlantic City, N. J.

† Doehler Die Casting Company, Brooklyn, N. Y.

France and Canada. The writer, after a careful investigation of the subject including the inspection of many samples of so-called aluminum die castings, does not hesitate to say that the commercial aluminum die casting is an American achievement and that the "Doehler" aluminum die casting process is the first by which aluminum die castings have been produced on a commercial basis in this or any other country. The Doehler Aluminum Process is no longer an experiment, having been in operation for more than two years, during which time castings have been turned out for use on many of the high priced automobiles and other machines. At the present time about 150,000 pounds of aluminum is being converted into die castings each month by the Doehler Aluminum Process. The spark lever, throttle lever, spark and throttle sector on most of the higher priced cars are aluminium die cast by this process. ("Automobile," September, 1915, shows a number of aluminum die castings.)

The alloy used in this process is strictly aluminum copper. By "strictly aluminum Copper" is meant that the alloy does not contain any tin, zinc or cadmium, which have been used experimentally in some aluminum alloys to aid their die casting properties. The alloy, however, is covered by patent and until the patent specifications are published, the writer is not at liberty to discuss it more fully.

While on the subject of aluminum alloys for die castings, the writer would like to point out a peculiar experience, which will be of particular interest to those called upon to investigate metallurgical problems. In the course of experimenting upon aluminum alloys about 4 years ago, the writer compounded an alloy consisting of equal parts of zinc and aluminum. The finest grade of zinc obtainable was used for this experiment as well as primary domestic aluminum. The alloy was poured into ingot molds 2" wide, 1½" thick and 10" long. In the course of about 2 years the ingot began to crack and warp. Upon further exposure the cracks penetrated through the entire thickness of the ingot in the most peculiar manner.

A short time ago the writer's attention was called to what was supposed to be an aluminum die casting. The part has undoubtedly been die cast, but the alloy appeared entirely too dark and heavy for aluminum. Having decided to analyze the sample, the writer took some filings from it, placed in a beaker and added a little distilled water preparatory to the addition of the solvent acids. The writer was impressed with the violence of the reaction formed by the mere addition of pure distilled water, which reaction was very much similar to that obtained by the addition of weak acids to commercial zinc upon boiling with pure distilled water more than three-fourths of the alloy was dissolved and only a black powder remained at the bottom of the beaker, showing that the alloy was entirely decomposed by distilled water. Upon analyzing the alloy was found to consist of an approximate even mixture of zinc and aluminum with the usual impurities of lead, iron and silicon. From the foregoing it may readily be seen that when specifying aluminum die castings it is also important to specify that they be made from a standard aluminum copper alloy and the purchaser should carefully guard against any new untried aluminum zinc, aluminum cadmium or other mixture which had been devised to meet competition and which are in most cases the result of mere chance mixing rather than of trained metallurgical investigation.

The writer in his last paper pointed out the fact that all die casting machines were constructed on two basic principles, viz., air machines and plunger machines. For the die casting of the higher fusing point metals such as aluminum and its alloys, the plunger machine must be discarded because the expansion of the cast iron of which the cylinder and plunger are made. The Doehler Aluminum process is of the air machine type, the metal being forced into the permanent metallic molds under an extremely high pressure. The writer regrets his inability to give the exact details of the process, since patents for it are still pending.

The aluminum die casting, although a practical commercial proposition, cannot economically replace the zinc alloy die casting where the latter is satisfactory, despite the lower cost of the aluminum alloy for the same bulk. The cause for this, which is in fact the most serious drawback to the expansion of the industry, lies in the life of the dies. A die for zinc alloys will last almost indefinitely, whereas with aluminum alloys, the best die material obtainable today will not produce over 5,000 castings without "heat checking." When the high cost of producing dies is taken into consideration, it will readily be seen that it must add largely to the cost of the casting if a new die is to be made for every 5,000 castings.

The past year has failed to develop the die casting of brass to any appreciable extent and commercial brass die castings are much in the experimental stage today as they were heretofore, in spite of the fact that this accomplishment has again been advertised in the various trade journals during the past year.

AMERICAN ZINC FOR HONGKONG.

[United States Consul General George E. Anderson, Hongkong, China.]

As an illustration of the movement of Far Eastern markets toward the United States for their supply of metals, it is interesting to note that a Hongkong firm has just placed an order in the United States for a considerable quantity of zinc. So far as can be ascertained, this is the first order for this metal placed in the United States from Hongkong. Considerable quantities of zinc are used in Hongkong itself and in the trade field tributary to Hongkong in the course of a year. Heretofore these supplies have been secured almost entirely from Germany and Belgium, though at times some of the metal has been secured from China. Zinc is produced in Kweichow and Hunan Provinces in considerable quantities, and is exported in ordinary years to the extent of about a thousand tons of spelter and ten thousand tons of ore, mostly to Germany and Belgium. On the other hand, spelter is imported into China to the value of about $80,000 ($78,295 in 1913), coming mostly from Germany, while the imports of zinc sheets and plates into China were valued in 1913 at $243,345, coming mostly from Germany, Great Britain, Belgium, and Austria-Hungary. To these imports, for the total coming into this field, should be added, perhaps, $100,000 as the value of the metal coming in this form into this field for local use and export other than to China. The Hongkong market in all such goods at the present time is dull, imports being confined to supplies for immediate needs only.

ZINC DROSS

The photographs of reverberatory furnaces and part of the description of the operation of same which appeared in the July issue of THE METAL INDUSTRY should have been credited to "The Metallurgy of the Non-Ferrous Metals," by Prof. W. Gowland, and the photographs of the revolving casting table and the micrographs to Vol. 2 of the proceedings of the Institute of Metals, London, England.

POLISHING AND PLATING ROOM PRACTICES REVIEWED

Some Observations of Bad Management in Metal Finishing Shops With Suggestions for Improvements.

By Franklin W. Hobbs.

Few if any trades follow "rule-of-thumb" methods, more than those of the polisher and plater, though the plating end has wonderfully improved within the past few years, thanks to the trade journals and organizations.

Improvement in the polishing room is not so much in evidence, though in most classes of work this division requires the greater part of the labor. One polisher prefers one kind of wheel and abrasive and another prefers another kind, while the number or grade of abrasives vary widely. Superior material is ofttimes rejected after giv- it only a limited trial, simply because the polisher was not familiar with the best method of application or willing to apply it.

It is surprising how little interest some men take in the equipment and material they are using day after day. Recently a polisher in conversation referred to his wheel as a stone. His early experience had been attained while turning a farmer's grind stone, and therefore to him any abrasive material seemed to be stone. Another man, in an effort to explain the cause of some poorly finished work, stated that the sand was too coarse on his wheel. Both were using compress canvas wheels set up with carborundum.

These were undoubtedly extreme cases of ignorance, yet the average polisher if asked what he used and how it was applied would state the kind of wheel and abrasive and that the wheel was coated with hot glue and rolled in the abrasive. As to the method of preparation of the glue, its temperature, also the temperature of the wheel and abrasive when combined. They would be considered of little or no importance, while, in fact, they are of the greatest.

THE GLUE POT.

The glue pot or its contents often get the blame for unsatisfactory wheels, and there is where it mostly belongs, though just what the contributing conditions are does not seem evident to many. It is the most common thing to see the polishing room glue pots coated with roasted and burned glue, which has been accumulated for days and sometimes weeks, and I believe at least one shop has furnished me with a specimen where the glue had accumulated in and around the pot for about a generation, judging from looks and smell. It is quite common to see steam constantly turned on and in direct contact with the glue pot, another bad practice.

In one shop, I found the practice was to keep what might be termed a stock pot in which the glue was cooked. When wheels were to be set up, the smaller pot was removed from the jacket and placed upon a large block of iron away from the heat. When the glue became too cool to spread satisfactorily, hot water was added from the steam jacket. This was sometimes repeated before the wheels were all set up. It must be evident to anyone who will give it a moment's thought that wheels cannot have uniform wearing qualities which have been set up with glue of such varying density. The small pot was replenished from the stock pot which was in turn filled with sheet glue without previous soaking, and the pots were never washed. The foreman informed me that the glue needed a lot of cooking to make it good, more bad practice.

THE ABRASIVE.

I visited a stove shop in which they were having difficulty with deep scratches. The foreman was inclined to blame the abrasive, and the people who made it, believing the grains to be mixed. The grains were in boxes with covers through which one might easily throw peas. There were other grades than those supposed to be in use. The glue pot and brush were investigated, which never being washed might have caused the difficulty, especially as but one pot and one brush were used for all grades. I suggested the possibility of some dissatisfied member of the crew purposely mixing the grains, but found that the foreman had perfect confidence in his men. They were supposed to be roughing on No. 120, fining and coloring on No. 150. A piece of work, directly from the roughing wheel, very promptly convinced me that it was not done on the No. 120. The man who had set up the wheels when pressed for an explanation, admitted that he had set them up in No. 60, bad practice again. The men were working piece-work. The castings were bad, and the grade on which they were supposed to rough was too fine for the class of work. To hasten the roughing an unduly coarse grain was substituted without the knowledge of the foreman. Therefore, to make time, the fining and coloring had to be slighted owing to the wide margin between Nos. 60 to 150, thus the deep scratches.

A bad practice more or less common is that of throwing wheels about upon the floor or elsewhere in a careless manner. Sometimes wheels freshly set up are thrown one upon another, the coarser on top, when grains may dislodge and adhere to the finer wheel before the glue becomes set, resulting in deep scratches upon the work, during the fining or coloring operations.

OTHER ABUSES.

The plating dynamo is often found covered with copper dust, the commutator badly cut up, and the brushes spitting fire, resulting in poor commutation and needless wear of commutator and brushes.

Some most crude and unreliable rheostats are found in use, while the switch board is supplied with neither voltmeter or ammeter. I found the men in one shop throwing the soapy water in which they had washed into the alkali cleaning solution and the foreman evidently considered it beneficial, as it was followed daily.

In a certain shop, the advice of an electrician was sought to devise some means of reducing the cost of stringing wire, no racks or hooks being used. They were advised to use a slightly larger size of wire, substituting iron for copper, and require platers to use it as long as it held together. The plater who could do so and not use "cuss" words missed his calling.

Another shop in which the practices were splendid except the one I shall mention used a large number of brass plating racks without any insulation, some of them bore deposited nickel to the extent of thirty or forty pounds, a needless waste of good material.

Another bad practice quite common and one which if remedied would ultimately correct the others which I have mentioned, is that of ignoring the trade journals. I know men who spend more for snake and freak papers every week than two good trade journals would cost them, and yet they say they cannot afford the trade journal.

SOME SUGGESTIONS FOR IMPROVEMENTS.

In contrast to the conditions and methods which I have described, a man should know what kind and grade of abrasive he is using, and what may reasonably be expected of them.

No. 60 is too coarse for any cast iron that has ever come to my attention, which is to be brought to a suitable finish for plating.

If so coarse a grade must be used, then it should be followed up with No. 90 or No. 100, and next with No. 150. The size of the grain to begin with must of course depend upon the roughness or smoothness of the casting, and generally speaking, No. 100 is sufficiently coarse. In case of good castings which have previously been water-milled, No. 150 will cut deep enough, while a worn wheel of the same grade will do the fining and coloring, the coloring wheel to be charged with a medium grade of tripoli composition. If a higher color is desired, the wheel may be further charged with charcoal and glazed with a hard smooth stone.

As to the kind of wheel in my estimation, anything superior to felt is yet to be produced, although there are some close rivals including compress canvas and cemented canvas with walrus hide well in the rear. Paper and bull-neck wheels are fine with which to fill holes in the ground. The setting up of wheels to get the best results calls for attention to details. The glue, if in the sheet form, should be soaked with cold water over night, if flaked or ground, an hour or two will suffice. Only a sufficient amount for one day's use should be soaked at one time, as it deteriorates in standing, according to one polishing engineer to the extent of 50 per cent. over night. Pots should be thoroughly washed every day. Water should never be taken from the jacket to put in glue as it contains rust and more or less foreign matter from the boiler and pipes. It should be melted only, and never boiled or cooked. Steam should never come in contact with the glue pot, the jacket should be full of water. A suitable oven should be provided in which the wheels and abrasive are heated, previous to being set up, the object being to bring wheels and abrasives as near the same temperature as possible, 140 degrees F. is about right. Then allow the wheels to dry in open air. These conditions tend to slow setting, which produces a strong bond. One man should set up the wheels and be held responsible for proper conditions. It is bad practice to allow each polisher to set up his own wheels. Where one wants the glue light and another heavy, generally speaking, a coarse abrasive requires a thicker glue than a fine grain, and where one man sets up the wheels, he gets familiar with the temper which holds best, and then maintains it. Abrasives should be used in long trays or pans, provided with tight overlapping covers, and one should never be used while another is open nearby, because of the danger of coarse grains flying into the finer ones.

The firm in whose shops the wheel man substituted No. 60 for No. 120 carborundum has since failed, and very likely the same slip shod methods followed in all departments, contributing in some measure to their down fall.

The foreman is a connecting link in the chain by which wealth is drawn from industry. It is his duty to be constantly on the alert, allowing no slip between labor and equipment, taking nothing for granted, but having his hand constantly upon the lever, feeling as it were the tension and controlling it, so that while due consideration is given each unit, there will be the least possible waste of energy and material.

Grinding castings with an abrasive so coarse as to leave a surface to be taken care of by the second operation which is nearly as rough as the original pit and scale is lost motion, and the foreman who allows it either has not a hand upon the lever or lacks the knowledge required for its proper application.

Wheels are most conveniently hung upon racks, and the finer ones should occupy the highest pegs.

The practice of throwing dirty, soapy water into the cleaning solution is probably a rare one, and even a little common sense will teach any one to abandon it.

Regarding the use of iron stringing wire. A larger size has to be used than would be required were it copper, owing to the inferior conducting qualities and rusting on the work rods. The larger size makes them more liable to break when bent, after being used once, owing to the deposit breaking and forming fulcrums over which the inner wire is strained.

The loss of time in tying and overcoming bad contact between work rod and rusty iron wire more than offsets the difference between cast of iron and copper. Uninsulated plating racks and hooks result in considerable waste, for, although they may be sold to the nickel-silver people, considerable less than half the original cost is realized, while new racks have to be constructed to replace those discarded. The hooks on racks should be made an integral part, being soldered on and the frame taped to prevent waste deposit, taking care to cover joints, so that when hooks get heavy they may be twisted off and new ones soldered on. A previous article described in detail several useful racks.

Plating dynamos are generally run under the most unfavorable conditions of any class of dynamos, owing to their close proximity to steam, acid fumes, and metal dust. Therefore, to keep them in proper running order, they require extra care. Commutators and brushes should be kept clean and smooth, and only slightly lubricated with vaseline, and no metal dust should be allowed to collect.

Suitable rheostats should be provided. Some of the crude contraptions that are in use cause waste of electrical energy, while they fail to secure proper regulation.

A plating room without volt or ammeter is somewhat like a ship without a compass, while if there is a voltmeter only, results are uncertain.

The amount of metal deposited depends upon amperes and time. One volt against a resistance of one ohm will give us one ampere, and if the resistance were always known the voltmeter would furnish us indirectly with the required information, but the resistance varies with every load, even when amount of work surface is the same, for the reason that there are so many points of contact between work rod and slinging wire, hooks and racks, which may or may not be perfect. A particle of dirt between a hook and the rod will increase the resistance, therefore it would require more pressure (volts) to force a given amount (amperes) through it than if it were perfectly clean.

Working by a voltmeter in the plating room is to my mind something like working by the pressure on a waterpipe, instead of the rate of gallons per minute, when a given number of gallons are required. One might figure the pressure and size of outlet (which would be the same as volts and ohms) and get the number of gallons, but it would be an indirect way, although in this case the resistance (size of pipe) would be the same.

Finally, every polisher and plater should subscribe to one or more good trade journals, and read them from cover to cover, thereby getting the benefit of other men's experience to combine with the result of his own practice.

MAKING THE SILVER SOLUTIONS

AN ARTICLE BASED ON FACTS GATHERED BY STUDY, RESEARCH AND EXPERIENCE.

BY OSCAR A. HILLMAN.*

The prosecution of experimental researches relating to the economical electro deposition of silver has recently come to constitute one of the important branches of electro-chemistry.

It used to be the consensus of opinion among manufacturers that anybody that could wash off work, make a chloride of silver solution and a mercury dip was a competent silver plater and when a batch of work stripped or spotted out they considered it one of the inevitable conditions of silver plating. The present competition between manufacturers has compelled them to demand accurate figures in place of guesses and output instead of excuses, and the natural result is that the guesswork platers are gradually being forced back to the college they graduated from, the scratch brush bench or the washing off sink. Probably sufficient has been said regarding the advantages to be gained by substituting cyanide of silver for the usual chloride of silver, and the only rational excuse any plater can advance for using chloride of silver for making a silver plating solution is that it takes considerable time and experience to make silver cyanide without losing a large percentage of the silver in the final washings, and commercial cyanide of silver is still too high priced to warrant its use in large quantities.

The porous cup process affords the plater the easiest and safest method of making a double cyanide of potassium and silver solution, and yet it is one of the inexplicable mysteries concerning electro-plating that although all of the early writers advocated the use of the porous cup and the electric current for making cyanide solutions, and it has proved the most economical and practical method known, comparatively few platers realize the full value of the process. The standard silver solution consists of six ounces of cyanide of potassium and three ounces of metallic silver per gallon, and while the porous cup is especially valuable for making strikes or out of the ordinary solutions, the above standard will be taken as an example.

MANIPULATION OF THE POROUS CUP PROCESS.

Fill the tank half full of warm water and add the full amount of cyanide, then weigh all the silver anodes and attach to the positive pole and submerge in the cyanide solution as for plating. The water in the porous cup should contain at least twelve ounces of cyanide per gallon. For solutions of fifty gallons or under a porous cup about four inches wide and eight inches deep will be large enough, but for making larger solutions the red porous jars that are used for salt water solutions will be found more practical. The cathode inside the porous jar is preferably made of a coil of sheet iron or brass and should have a surface approximately equal to that of the anodes.

It is of the utmost importance to have the anode hooks and cathode connection large enough to carry the full ampere capacity of the dynamo, otherwise they will become very hot and offer undue resistance. When tanks are equipped in such a manner that the cathode rods are kept in motion by mechanical means, it is always feasible to change the poles so that the anodes are kept in motion as it greatly accelerates their reduction.

The amount of silver dissolved in the solution may be determined by timing an amperemeter; two and one-half pennyweights of silver being run in every ampere hour, but as the rate of flow increases in proportion to the increase in conductibility of the solution, it is quite a complex proposition and the simplest way is to weigh one of the anodes, and by weighing it at frequent intervals the rate of reduction may be easily deduced. As soon as the weight of the master anode indicates that sufficient silver has been run off, all the anodes should be dried and weighed again, as it frequently happens that all the anodes do not dissolve at a uniform rate and the result is that there is quite a substantial discrepancy in the figurative and actual weights.

When enough silver has been run into the solution the porous jar should be removed and enough water added to fill the tank. The entire time used to make the solution (regardless of its size) should not exceed two hours, provided enough anodes and current are available. If over four volts is used all iron rods and anode hooks must be above the solution or the oxygen liberated by the high E. M. F. will corrode them very rapidly and make the solution dark brown in color. After the solution has been in use until it shows a depletion in metal content it should be tested for free cyanide and metal, and enough cyanide added or metal run in to build it up to standard.

Dry silver cyanide is the simplest medium to use for making a working test for free cyanide. A simple yet very accurate method of finding the metal content is to evaporate a quart of the solution to dryness and mix the residue with an equal amount of chloride of ammonium and melt in a crucible. The silver button will weigh fifteen pennyweights if the solution is up to standard.

ADVANTAGES OF BRIGHT SILVER PLATING.

The addition of a small amount of carbon bi-sulphide (previously dissolved in caustic soda and cyanide) to a silver solution prevents the occlusion of hydrogen at the cathode and causes the groups of silver atoms to become more closely laminated to each other, and the consequence is that the deposit is hard, fairly bright and the necessity of scratch brushing articles that are to be subsequently polished is eliminated. If too much carbon bi-sulphide is used, hydrogen sulphide gas is formed at the cathode by electrolytic action and the articles being plated turn dark brown. The deposit then becomes extremely flocculent and streaky as the gas acts on the silver forming silver sulphide. The perpendicular streaks are caused by the formation of lines of least resistance and the upward travel of the gas. Ammonium hydrosulphide solution or the sulphides of barium or antimony may be used in place of the carbon bi-sulphide.

The free cyanide of potassium in all cyanide solutions gradually becomes converted into carbonate of potash, and although some silver solutions have been used for years and a cursory examination of the deposit obtained indicates that the solution is in good condition, physical analysis proves that all deposits obtained from solutions that contain a large amount of carbonates are porous or spongy and do not take a finish or resist wear like deposits obtained from new solutions. Theoretically, hydrocyanic acid can be used to convert the carbonate of potash back to cyan-

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ide of potash, but its use requires so much preliminary analysis and the final results are so unstable that its use cannot be recommended.

THE STRIKE SOLUTIONS.

The strike solutions are where the base for the final plate is obtained, and too much care cannot be used to keep them clean and in proper condition. The strike must be built up to fulfil the requirements of the work and the electric current used, but all work should come out of the strike clean and clear or at most with a slightly smoky appearance. If the articles are burnt or covered with a heavy smut the plating can never be done in a satisfactory manner, and it is better to strip the silver off and have the articles refinished. Peeling of the plate and spotting out can invariably be traced to improper cleaning or the use of a strike not adapted to the class of work plated. It has been conclusively proven that the addition of copper compounds or the use of copper anodes in a silver strike is very poor policy, as the copper held in solution interferes with the migration of the silver groups and their deposition.

MELTING ALUMINUM CHIPS*

SOME VALUABLE INFORMATION OF GREAT IMPORTANCE TO USERS OF ALUMINUM.

BY H. W. GILLETT.†

This paper was written at the request of the Chairman of the Papers Committee, and is based on some recent work which will be published in full as a Technical Paper of the Bureau of Mines. Since a fuller account will soon be available, the present paper aims to deal with the subject only in a brief and sketchy manner.

If a foundryman attempts to melt down the No. 12 alloy chips made in machining aluminum castings for automobiles in the same way he would melt brass chips, either by adding them in small amount to a pot of metal, or melting them alone, he usually gets somewhere between 50 and 70% of the chips into a pool of metal in the bottom of the pot and from 30 to 50% into a light fluffy dross that, as soon as the air strikes it, gets excessively hot, glows with a blinding light and smells of ammonia when moistened.

One naturally supposes that the cause of this dross formation is the great affinity of aluminum for oxygen and that the dross, i.e., the loss, comes from oxidizing conditions within the furnace. The foundry magazines in their "asked and answered" columns, tell us every month or so that to melt aluminum borings one should get a pot half full of molten metal and then stir the borings in so as to cover them with metal and keep the air away from them, finally fluxing with sal-ammoniac or zinc chloride. The trouble is that the borings prefer to stay on top and refuse to be stirred in.

If the borings are, and those from most machine shops almost invariably are, contaminated with even two or three per cent. of fine dirt, such as floor sweepings, one can melt in a closed retort, or in an electric furnace in the entire absence of oxygen, and still get very low recoveries and copious amounts of dross.

The real trouble lies in the fact that a large proportion of the chips are only about 5-1000 of an inch thick, and will pass a 20 mesh riddle. When such a chip melts it forms a globule of metal about as big as a pin point. Each chip has had an infinitesimally thin film of oxide on it, formed the moment it was cut. That such thin films prevent metallic contact between aluminum surfaces is plain from the fact that a bundle of aluminum wires may be twisted together and brought up to the fusion point without welding together at all unless they are forced together, so that the film is ruptured or unless a flux that will disolve aluminum oxide is used.

Each little pin-point globule is then surrounded by a film of oxide, infinitesimal in thickness or weight, but yet sufficent to keep the globules from uniting. If any fine dirt is present, this reinforces the oxide armor and makes matters worse.

So our dross, instead of being mainly aluminum oxide, is mainly tiny globules, separated by films of oxide and dirt. Were this not the case, and were the dross all oxide, it would not get hotter on striking the air when skimmed off. Thus, while the cold dross is oxide, the hot dross is an emulsion of metal droplets kept separate by a solid honey-comb-like structure of oxide and dirt.

The problem is then, mainly one of getting these tiny droplets to coalesce and to free themselves from the dross. The common method is to stir sal-ammoniac or zinc chloride into the dross. These "fluxes," so-called, are really mainly stirrers. They gasify at temperatures below the melting point of aluminum and the violent evolution of gas tosses the mass of dross about, throws some of the globules together with such force that the enveloping film is ruptured and a few of the globules coalesce. But the volatile fluxes are not very efficient stirrers and the dross, after they are used, still burns up in the air almost like a flash-light powder, because of the metallic aluminum still left in it.

It is, of course, desirable to melt in a reducing atmosphere, if possible, but oxidation within the furnace is far less troublesome and far more readily overcome than the reluctance of the globules to coalesce.

Many methods of melting chips have been suggested, ranging from the use of vacuum furnaces to that of patent fluxes with enticing names at 25 cents per pound. Space is lacking to go into all these here. Two methods, both of which aim to promote coalescence, are in use by two firms refining aluminum chips on a large scale, and give good results.

The first of these is the "puddling" process. Melting is done in oil-fired furnaces, using iron pots, the furnaces being provided with close-fitting hoods. The empty pot is heated up to a low red, and a few shovels of chips put in. The furnace tender stands by with a big skimmer and works the chips over constantly till they start to get pasty. Before they are fully melted, he adds another small dose of chips and work that into the dough-like mass. The mass is not allowed to get visibly red. The addition and the working over of the chips is continued till the pot is full, holding the temperature practically at the melting point. By the constant stirring of the pasty mass, the tiny globules are pressed together, and the films of oxide and dross broken through, so that the result is a uniform pasty mass of metal, enveloping particles of dirt and oxide instead of a little molten metal below and a mass of

*A paper presented at the Annual Meeting of the American Institute of Metals, September 28 to October 1, 1915, at Atlantic City, N. J.

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dirt and oxide enveloping globules above. The pot is then covered and the metal heated to about 700°C or 1300°F till the dirt and dross rise.

Zinc chloride is then stirred into the risen dross, and the dross skimmed rapidly into water so as to stop oxidation and allow the recovery of entrained metal.

This method gives about 70% recovery on the ordinary dirty borings of commerce. On borings cut with a water-soluble cutting compound, if the wet borings are allowed to dry out in the air, to oxidize and cake up, the recovery by this method is 50 to 60%. But if these borings are very carefully kept free from dirt and are promptly dried, after cutting, by centrifuging, these clean, dry borings give 85 to 90% recovery by this process.

The puddling process requires the constant attention of the furnace tender, and the daily output per man is small.

The other process is based on the same principle as that of welding aluminum, where fluxes composed of chlorides and fluorides of the alkalies or alkaline earths are used to dissolve the film of aluminum oxide and to allow the metal surfaces to unite, fluorides being the best known solvents for aluminum oxide as well as good ones for siliceous dirt. The chips are intimately mixed before charging with large amounts (20 to 50% of the weight of the chips, depending on the degree of cleanliness of the chips) of a flux consisting of about 85% common salt and 15% powdered fluorspar. The mixture of chips and flux is put into large crucibles, heated in a coke fire. As soon as the chips start to melt, they are jammed down to make room for more mixture, and so on till the pot is full.

The pot is then left undisturbed without stirring, till the flux is fully melted, and fluid enough to absorb, either by true solution, or by soaking it up mechanically, the oxide and dirt, and to allow the tiny metallic globules to fall through it and collect in a molten mass. This requires at least 900°C or 1650°F.

On absolutely clean borings, this method gives 90 to 95% recovery, while chips very foul with dirt may give but 65%.

This method cannot be used in iron pots because the temperatures required are too high for reasonable pot life. It will probably require more fuel than the puddling method because of the higher temperatures and because so much flux must be heated up. The flux, though it has to be used in large amounts, is so cheap that it is hardly more expensive than the zinc chloride used in the puddling method. The crucible expense will be a little higher than that for iron pots in the puddling method, but the labor cost should be very much lower.

Moreover, it is quite possible that by increasing the amount of flux to correspond with the greater surface of the metal bath in a reverberatory than in a crucible, that the salt fluorspar flux method might be used in reverberatory melting.

Experiments indicated that dirty, oily borings might be cleaned by washing with a weak caustic soda solution, perhaps freed from dirt on a concentrating table and dried by centrifuging, but whether such cleaning would pay commercially is a question. It is also an open question whether briquetting will pay commercially.

But it is certain that keeping the borings scrupulously clean and free from dirt or dust, keeping them free from contamination by iron or brass chips, and centrifuging off water soluble cutting solutions, are advisable, and that the higher recovery from clean chips will pay richly for a little extra care in the machine shop.

On tests of a lot of commercial borings containing some ten per cent. of very fine dirt, the average recoveries, figured on the true metallic content of the chips, were as follows:

	Gas-fired crucible furnace	Electric crucible furnace	Small gas fired reverberatory
No flux	55%	..	.....
Volatile fluxes, sal-ammoniac zinc chloride, etc., with stirring, but without constant puddling	65-70%	70	50-60%
Retorting or stirring into molten metal ..	65-70%	..	.....
Briquetted chips stirred into molten metal....	75%	..	.....
Puddling process.....	70-80%	..	.....
Salt fluorspar flux.....	75-85%	85	80-90%
Briquetted chips with salt fluorspar	90%	..	.....

Up to say 25% of ingot obtained from borings by either the puddling or the salt-fluorspar process can be used in many simple castings without detriment to the quality or strength of the castings and without increase in foundry defectives. If iron is kept out the composition will not change materially in refining, and, if desired, a furnace or two can be kept busy on borings, and the molten metal mixed in the desired proportions with new metal from other pots and castings poured direct from the mixture without having to ingot the metal from the chips for later remelting.

INCREASED EXPORTS OF ALUMINUM AND ALUMINUM PRODUCTS.

The value of the exportation from Switzerland of aluminum and aluminum products increased from $2,597,008 in 1913 to $2,871,454 in 1914. The principal manufacturer in this line is the Aluminum-Industrie Actiengesellschaft, at Neulhausen, and the annual report of this company for 1914 indicates that the general situation was favorable. The company increased its nominal capital during the year from 26,000,000 to 35,000,000 francs ($5,018,000 to $6,755,000). The net profits were again increased from 6,383,363 to 6,663,098 francs ($1,231,989 to $1,285,978) and a dividend of 20 per cent. was again declared. This company has a number of subsidiary and branch factories in different parts of Switzerland, as well as in France, Austria, and Germany. The subsidiary factory in Marseilles, France, was placed under sequester at the beginning of the war, on the supposition that the main company was a German concern, and in this way the supply of bauxite was somewhat limited; but, on the other hand, this deficiency was at least partly made up by the product of the new subsidiary factory that was established during 1914 at Bergheim, near Cologne, Germany.

The exportation of articles of aluminum is gradually growing in importance, the value of these exports having increased from $347,932 in 1913 to $498,450 in 1914. Considerable interest is centered in the aluminum foil which has recently been brought on the market here, and which is intended as a substitute for tin foil in packing chocolates, cheese, etc.—From United States Consular Reports.

POLISHING AND BUFFING

SOME INTERESTING REMARKS RELATING TO THESE METAL FINISHING PROCESSES GLEANED FROM TWENTY YEARS' EXPERIENCE.

BY B. H. DEVINE.*

I was very much interested in the description of Richards Polishing Machine, as shown in the September issue of THE METAL INDUSTRY. This machine, by the way, from the description given, is not a polishing machine at all, but a buffing machine, and there is a wide difference between a polishing machine and a buffing machine and between the meaning of the two words. This, in connection with the article on Page 379, headed "Efficiency, Standardization's Double," induces the writer to butt in with a remark or two on the necessity of standardization, as well as efficiency in the polishing and grinding and the plating departments of the metal working trade.

For over 20 years the writer has made a personal hobby, as well as a business, of the metal polishing work, and particularly in the last three or four years has been impressed with the necessity for both standardization and efficiency and with the remarkable results that are obtained whenever a manufacturer takes hold of these two questions in his finishing departments. There has been a woeful lack of the proper tools for polishing rooms and the general lack of information is worse than deplorable.

In polishing rooms one of the worst conditions I have found in visiting factories all over the United States is the question of the use and treatment of glue, and, as a matter of actual fact, I have not found one man in 500 that really knew what glue was and how it should be used, and upon the proper use of glue depends the biggest item of waste or extravagance in the polishing room, that of applying emery and glue to polishing wheels and removing it before it has been used up in the production of work. It is a very common thing for the writer to find that glue users are unable to get no better results from a really good glue, costing from 16½ cents to 20 cents a pound, than from the cheaper form of glues, running from 10 cents to 12½ cents a pound; but the trouble is not with the glue, it is with the way it is worked.

As a citation of the possibilities along these lines, I would like to present the case of a concern in the Middle West, who called the writer to their plant to talk over their polishing work in its entirety and to install tools and processes to give them better and more economical results, if possible, with the result that 60 days after the first outfit was installed and the processes suggested by the writer were put into use a test run of the work showed that they were saving 70% over their previous cost of production. How many factories would be glad to save 70% on their cost of production, and how many manufacturers would believe it possible if we were to write them a letter or call on them and tell them this could be done? They would consider us in common parlance "crazy." As a matter of fact, the whole polishing trade is in such a deplorable condition that such figures are not uncommon.

We are doing a great deal of finishing work nowadays, handling everything from the arrangement of a polishing room, installing all of the tools, processes and materials right up through to the last detail, and, in most cases, it is a complete overthrow of the old conditions with very satisfactory results to the manufacturer. The only wonder to us is that we have been left alone in this field and no one has considered it of enough importance to take up the business, which is probably due to the fact that we have worked in closer touch with it than anyone else, have made it a distinct business and made a study of it.

It is a well-known fact that there are no statistics or publications of any sort on the questions of metal finishing, and it has been the writer's intention for some time to reduce to printed form the mass of information that has been secured through his many years of experience in the business.

Would the reader of this article think it possible that the managing director of one of the biggest cutlery plants in England had, until the writer showed him an American plant, never seen and apparently had never heard of a blower system, and when the writer took him into this American plant in question to show him American methods the first thing his eyes lit on were the dust pipes, and his first question was, "What are they and what do they do?" He immediately left the writer and followed the line of the pipes to the outside of the building to see where they went to. The concern that man manages is hundreds of years older than any cutlery plant in America and is known the world over as a high-grade concern.

Another interesting case, the outcome of which struck the writer very amusingly, was a visit to a large concern manufacturing ovens for heating or drying. During the writer's visit the manager showed him a large oven completed and ready for shipment to one of the largest manufacturing concerns in New England, to be used FOR POLISHING WHEELS after they had been glued up. Just imagine it, doing the very worst thing possible that can be done to glue, hastening its setting which is absolutely fatal to it. Glue requires 48 hours to set and anything done to hasten the setting is extremely detrimental to the glue.

The writer wrote to the concern for whom the oven was intended and, as modestly and intelligently as he could, called their attention to the fact that the oven could be used to much better advantage for heating the wheels before the glue was applied rather than after, and received a rather stilted reply, stating that they had had some experience themselves and needed no suggestions.

Every good mechanic knows that no rotary cutting wheel will operate advantageously or satisfactorily unless it is perfectly round and true, and an examination of the average polishing wheel, especially the old type, such as the wood block wheel, leather-covered, showed that from 20 to 25% of the surface of the wheel had actually been in contact with the work and the efforts of the workman to hold a piece of work firmly against high spots of a wheel is hardly conducive to the production of an optical surface.

This leads up to the question of keeping the wheels in good condition and brings out the fact that the only tools heretofore in existence for cleaning polishing wheels have been the water rollers, which have done more damage than good, and the abrasive bricks by which the old emery and glue has been removed by hand operations.

*President Devine Brothers Company, Polishing Engineers, Utica, N. Y.

There has never been a machine or tool of any kind on the market to dress old emery off of polishing wheels. The result is that the necessity for such a tool has induced us to market one, and we are just offering to the trade a tool in the form of a lathe for dressing old emery off of wheels and keeping them perfectly round and true. The concern with which the writer is connected has gone still further and is bringing out a complete line of tools, which experience has shown are absolutely necessary for the proper equipment of the metal finishing department.

It is just as easy and as reasonable to reduce the processes of metal finishing to an absolute standard as it is to standardize any other department of a business. The question, however, is the lack of centralization of the information necessary to do this, and when the average manufacturer looks about outside of his own plant for information he finds it very difficult to secure.

One shining example of the desire for information and the introduction of efficiency methods has recently been shown in the pocket cutlery trade, which has up to date been one of most hide-bound, old-fashioned trades in America. A great many of the largest cutlery factories are still doing business on the old English cutler system, where a man takes the complete parts for a certain number of knives and does every operation himself, but there has been a sudden awakening in this trade, and the universal demand and desire to modernize the business has brought us in pretty close touch with the cutlery makers, and such work as has been done so far has been remarkably successful, largely due to the fact that they were so far behind the times that very little was necessary to make a substantial change.

A great deal is being done nowadays in the grinding line in the way of substituting flexible grinding wheels in place of solid abrasive wheels, either emery wheels or grindstones, for wherever the loose abrasive can be glued to a wheel it is a far cheaper process and in a great many cases more effective than using a solid wheel. The possibilities along this line are very great.

There is also a great deal of good being accomplished nowadays by the manufacturers of abrasive grains, replacing the mined product, and we regret to find that a great many polishing foremen have little idea of the difference between the various kinds of emery. To them emery is emery, the only difference being in the size of the grains, whereas there is a very great difference in the kind of work to which the various kinds of emery are adapted.

The writer would be very glad indeed to get in touch with other people who are interested in similar lines of work, for he realizes that a great variety of experience is necessary to standardization, and the time has got to come before long when polishing and grinding processes will be just as standard as any milling machine or lathe operation, and while we are contributing our little quota of knowledge every day the field is so broad that we cannot hope to make more than one little scratch.

RESISTANCE WIRES

By R. F. Hunt.*

The constantly increasing use of appliances requiring resistance wire has brought the manufacturer of alloyed wires to a place of great importance in the electrical industry and has caused the development of several new alloys. Where ten years ago German silver and nickel were the only resistors in use we now have upwards of a dozen alloys, each with its own particular use.

The popularity of electrically-heated devices is furnishing a constantly-increasing market for nickel chromium wire and ribbon. The alloy of nickel and chromium was discovered by chance in England twenty years ago, and even at that time was known to have wonderful durability. It was then lost sight of until 1904, when it was first applied in connection with a heating unit. While the nickel chromium proved particularly adaptable for this purpose there was great difficulty experienced in drawing the wire on account of the extreme hardness the chrome lent to the alloy. Continued experiments overcame this difficulty so that at present, except for a few European makers, who still stick to nickel, it is universally used by device manufacturers.

Ranking with nickel chromium in importance is the nickel copper. This alloy possesses a zero temperature co-efficient, making it particularly adaptable for rheostats or electrical measuring instruments where it is essential that there be no change in the resistance with varying temperatures. In 1914 over twenty-nine million spark plugs were used in this country alone. As nickel manganese is used in the electrodes, this offers another big field to the resistance wire manufacturers.

The next development of importance in the resistance industry is nickel chrome steel. Wire of this alloy possesses a high specific resistance and is practically non-corrosive. The cost per ohm being very low, it is largely replacing the straight nickel steels for use in arc lamps, controllers, moving picture machines and heavy duty resistances in general.

Instrument makers, in addition to copper nickel, use considerable nickel copper manganese. This alloy is imported under the names of manganin and tarnac. Pure nickel, though replaced in many instances by copper nickel and other alloys, still has many uses. The principal ones in point of quantity consumed being for anchors in tungsten lamps and supports for gas mantles. For heavy duty resistances nickel steel finds favor and can be found in many of the standard makes of rheostats, controllers and the like.

Despite the fact that several alloys have been substituted for it, principally copper nickel, there is still a large demand for nickel copper zinc (German silver). While many manufacturers of apparatus have been quick to adopt the substitutes as they came on the market, a sufficiently large number have stuck to the German silver to make it remain an important product in the resistance wire field.

The present war has given great impetus to the domestic manufacture of resistance wire. It has entirely freed our manufacturers from foreign competition in the finished product and made it necessary to obtain the raw material from domestic sources. The

*Sales manager Electrical Alloys Company.

German manufacturers enjoyed a very considerable business for several years before the war, having been the pioneers in the industry. Germany also had the bulk of the business in England, Italy, France—in fact, in all countries using the material. This business has naturally gravitated to the United States, and the mills in this country are being taxed to their utmost to fill the export orders that are coming practically unsolicitted.

The difficulty in getting the raw material from abroad has led to hurried research and experimentation on the part of the American manufacturers, so that every alloy can now be supplied from a domestic source with the possible exception of manganin. Both the nickel copper and the nickel chrome have been wonderfully improved upon within the last few months and compare very favorably with the foreign product. In the field of resistance wire, then, we can say that in one short year the American manufacturers have successfully met the problem of being cut off from their supply, not only by bringing their product to being independent of foreign source, but at the same time greatly improving the quality of their materials.

FUNCTIONS OF SAND BINDERS*

SOME INTERESTING INFORMATION RELATING TO THE MANUFACTURE OF CORES FOR VARIOUS KINDS OF METAL CASTINGS.

BY H. M. LANE, DETROIT.

In foundry practice a sand binder is that agent which holds the grains of sand in the body of a mold or core in place when the metal is introduced into the mold. The binder must be of sufficient strength to hold the sand rigidly until the surface of the metal has solidified to form a protective skin. At the same time the binder must be of such a nature that it will release the sand grains after the casting is set, so that the sand can be cleaned off with the greatest possible ease.

Dry sand molding, skin dry work, green sand molding, dry sand cores, and green sand cores, merge into one another so closely that it is impossible to separate these classes by any distinct lines or division, hence in this paper the subject of binders will be considered in relation to sand regardless of whether the sand forms the body of the core or mold.

There is one point in regard to binders that should be made plain at the beginning, and that is that binders exert two different influences at different points of the molding or core-making operation. In the case of dry sand molds and cores, it is necessary to have something to hold the body of the sand in shape previous to and during the drying process. The agent used for this purpose is commonly known as a green binder. In the case of green sand molds and cores the green binder only is required.

CLASSIFICATION OF BINDERS.

There are a good many ways in which binders can be classified, but probably as good a general classification as we can find is to divide them into water soluble binders, paste binders, colloids and allied bodies, and gums, pitches and oils. The first two classes are all subject to moisture, and cores made from them are likely to soften if exposed to moisture. The colloid bodies may or may not be subject to injury from moisture, while the gums and pitches are as a rule water-resisting or water-proof.

Under the heading of water soluble binders we have molasses, sour beer, distillery refuse, paper mill waste products, such as glutrin, corn syrup waste products, such as hydrol, glue and silicate of soda.

Under the paste class we have three general types known as flour, starch and dextrine. The flour includes wheat and rye flour, fine ground white corn used as an adulterant for wheat flour and pea meal. Under the starch class we have corn starch, wheat starch and potato starch. Dextrine is made from starch and gives a stronger paste than the other starches used.

Under the colloid class we have clay, magnesia, milk of lime, alumina compounds and iron compounds or combinations of these. The binding power of horse manure or cow manure is due to the colloidal nature of some of its ingredients, and also to the reaction which it has with the hay which serves to increase or support the colloidal condition of the clay.

Under the gum class we have resin, pitch obtained from the distillation of coal in making alluminating gas, or tar from gas producers, pitch from the destructive distillation of wood, and various kinds of asphaltum or pitches from petroleum products.

Under the oil class we have at the head of the list the drying oils which are headed by linseed oil, and china-wood oil. The iodine number of an oil as taken in the paint trade forms a very good index as to their binding properties. This class includes whale oil, and various fish oils, such as manhadden oil, soyabean oil, cotton-seed oil, sunflower-seed oil and a large variety of oils of vegetable origin.

Next we have the filling oils, which are used largely as adulterants with the drying oils. There are four general sources for this class of oil. First, the class known as neutral oils which come from petroleum. Second, the tar oils which come from the ordinary rectification of gas house tar. Third, a small class of oils which are made through a destructive distillation of certain coal or shale products, which are produced in small quantities for the paint trade. Fourth, resin oil, which is made from the destructive distillation of resin. There are also oils from the destructive distillation of wood.

The action of the various binders mentioned have considerable to do with their sphere of usefulness. It may be wise first, however, to consider something of the different conditions to be met by sand binders.

BINDER REQUIREMENTS.

When casting aluminum we are face to face with a very light metal, which sets quickly after pouring, and which has hot-short tendencies. The fact that the metal is light, or of low specific gravity, results in the molds not being subjected to serious pressure due to the head of the metal during the pouring. Its quick setting and low pouring temperature protects the sand from great heat, and at the same time gives little available heat to burn out or reduce a binder. Its hot-short tendencies make it necessary to have a core which will crush readily. This means that for this type of work we must either have a soft, pliable molding or core-making material, such as a soft, green sand

*Paper read at meeting of American Foundrymen's Association, Atlantic City, N. J., September 28-October 1, 1915.

mixture, or we must have a binder which softens immediately upon exposure to heat so that it can give way before the shrinking metal. The latter conditions are met by the use of resin, and to some extent by pitch.

When we encounter a high phosphor bronze we find a metal with great searching power, that is a metal that is so fluid when molten that it has a tendency to flow in between the sand grains themselves. This character of metal calls for a core with a very tight surface, which is not very readily penetrated with the metal. This is accomplished by the selection of a grade of sand having fine grains of a comparatively uniform size with possibly the addition of some surface finish to the core or mold.

In ordinary gray iron castings we have a metal that sets much slower, and is so heavy as to have a serious lifting effect, which tends to strain or change the shape of the mold, or to displace cores. Cores for this metal necessitate a much stronger material than would be required for aluminum, but at the same time we have available many more heat units per cubic inch of molten metal, and this tends to disintegrate or break down the binding material so as to often soften the core.

In steel we find the same conditions existing as in gray iron, with the exception that we must be careful in the selection of molding sand, core sand, etc., to avoid all fusible ingredients.

ACTION OF BINDERS.

Referring to the binders, in the water soluble class we find that molasses binds by boiling up, and then hardens as plates of taffy or partially charged sugar. It is this boiling of the molasses just before the final set that has a tendency to deform molasses cores.

Thus far certain brands of cane sugar molasses have been found best for core-making. Some years ago the writer carried on an extensive series of tests to ascertain the relative advantages of different forms of molasses and the effect of fermentation on the binding power of this material. The results of these tests proved conclusively that there is a wide difference in the binding power and that fermentation in any given grade of molasses would destroy over half of the binding power.

In this series of tests some interesting results were obtained from beat sugars or beat syrups. The cores made with these materials as a binder, when first baked, were of excellent strength, but they were unsatisfactory in that they would draw moisture from the atmosphere and fall to pieces on the slightest pressure. This is found to be due to the presence of certain salts in the molasses, particularly potash and soda.

Sour beer owes its binding power largely to the presence of dextrine and similar ingredients, and this also is true of distillery refuse. The ingredients present, which have not been converted into sugar and then changed to alcohol, act as binders.

Glutrin binds in a very different manner from molasses. With absolutely sharp sand it has a tendency to follow the water to the surface, giving a hard skin next to the metal and a core with a soft interior. The introduction of clay or any colloid will tend to hold the glutrin in the body of the core, which greatly increases the strength and gives a uniform structure throughout. Glutrin, like oil, draws down to the contact points of the sand, thus giving a far greater efficiency per pound of material than is obtained with many other classes of binders.

Glue, like glutrin, draws to the contact points, and gives good results, but it emits disagreeable odors during pouring and is subject to serious fermentation difficulties.

Hydrol is a residual obtained from the corn sugar industry, and it binds much like molasses, though with less tendency to bubble. However, it has quite a tendency to absorb moisture, in this respect being more like the beet syrups.

Silicate of soda has not proven successful as a mold or core sand binder on account of the fact that it does not release readily when the metal is poured into the mold, in other words, when it is exposed to heat.

PASTE CLASS OF BINDER.

Taking up the paste class, under flours we find wheat flour the most efficient on account of its large percentage of gluten. Other flour compounds are efficient in proportion to the amount of gluten or sticky material which they contain. Rye flour is never as efficient as wheat flour, and while ground white corn can scarcely be differentiated from wheat flour by ordinary chemical analysis it has practically no binding power. Pea meal, which is used in some sections, has relatively little binding power, and middlings or other similar products are only efficient in proportion to their amounts of gluten or sticky material.

Under starch, we come to a peculiar class of binders. This material is generally used in the uncooked state, in which condition it acts as a paste. All paste, whether flour or starch, binds in a purely mechanical way, that is, the particles of binder are distributed among the sand grains, and ordinarily dry at the point where they are left. If the paste particle happens to bind two grains of sand together it becomes efficient, but if it happens to occur between sand grains in the open spaces it adds nothing to the strength of the core and only tends to close the vent space.

When starch is cooked or treated chemically in such a way as to make a liquid paste, we then have a binder which behaves more like oil in that as drying progresses it draws back toward the contact points of the sand, thus giving better binding action.

Dextrine is a derivative from starch, having more binding power in the uncooked form than starch.

OIL AND CLAY IN OPPOSITION.

In the group of colloids, we find that clay, which is the natural bond of molding sand, plays an important part in foundry practice. In order to develop fully the binding properties of clay, it must have undergone the process commonly known as weathering. It was formerly considered that it was simply the water from decaying vegetation that effected this change, but it is now recognized that bacteria probably play an important part in the changes.

As already stated, there are reactions between these natural binding materials which the chemist calls colloids, and there are also reactions with the various binders used in sand. Flour, starch and dextrine work in harmony with clay. This is also true of most of the water soluble binders, but all of the oil binders act in opposition to clay. The clay first absorbs as much oil as it can, thus taking it away from its legitimate use as a binder, and at the same time the oil destroys the binding power of the clay.

Particularly in steel foundry practice there are some silica sands in which magnesia plays an important part as an active binding material, and there are cases in which milk of lime or other chemical compounds have proven useful, but this group has not received much attention from foundrymen.

We now come to the class of gums. In this class rosin stands by itself. When powdered rosin is mixed

with sand as a binder it melts during baking, and flows between the sand grains. Upon cooling, the rosin acts as a binder. For this reason rosin cores are known as hot-soft cores on account of the fact that when the rosin is hot it has no binding power.

If rosin, in a mass, is heated to 645 degrees Fahr. at ordinary pressure, it is decomposed into rosin oil, and rosin pitch. At this temperature the elements which compose the material rearrange themselves into different forms with radically different chemical properties. Rosin oil is used extensively in the paint trade, and has also been used as an adulterant for core oil. It, however, has a very small percentage of the binding power present in the original material. When a rosin core is exposed to the molten metal the rosin is decomposed as previously mentioned, and the rosin oil passes off as a vapor. Between 80 and 90 per cent. of the rosin passes out in this way, and the result is that when rosin cores are used with any metal having sufficient heat to decompose the rosin, easy cleaning conditions prevail.

The vapors from the rosin which condense on the red hot surface of the interior of the casting undergo a second decomposition with the deposition of free carbon, which gives the castings a beautiful, glossy black surface.

The other members of the rosin family include all of the varnish gums and the different ambers, but these materials are too expensive for a core binder.

BLACK COMPOUNDS.

The so-called black compounds are usually made from rectified pitch which comes from the distillation of coal tar. These tars generally carry about 50 per cent. of fixed carbon, or in other words, give 50 per cent. of very hard coke. For this reason they vary greatly from rosin. During the baking of the core the pitch melts, flows between the sand grains, and binds the material, in this way acting like rosin; but during the casting process a relatively small amount of volatile material is driven off and hence a much larger percentage of coke is left behind. Then, too, this coke has a very hard nature, and frequently makes the core stronger after the metal has been cast around it than it was before it was put into the mold. This coking explains the rebaking effect frequently referred to by foundrymen.

OIL BINDERS.

When we come to the class of oils we encounter two bold divisions. The first represents the drying oils of the paint class. With a true drying oil the binding power is developed, not by the evaporation of something from the oil, but by the oxidation of the oil itself so that the binder in the core, after baking, weighs more than it did before baking. The difference, however, is very slight and amounts to an increase of approximately 1 per cent. of the weight of the binder, and as in this class of cores the binder is used in the ratio of 40 to 80 parts of sand to one part of oil, it will readily be seen that this increase is so small it would not be noticed in the final results. Also, it is more than counterbalanced by the exclusion of moisture from the sand. With the drying oils, as the moisture is driven out, the oils draw between contact points of the sand, and then harden. The drying of good oil is hastened by adding what is known to the paint trade as dryer. The chemist calls this a catalytic agent or something which has the power of causing changes without itself being changed. For example, certain manganese salts have the power of extracting oxygen from the air and giving it to the oil in such a way as to cause a much more rapid oxidation than could be caused by air alone. With a good drying oil the atmosphere of the oven is a very important factor in the rate of drying, and there must be a positive circulation of a proper amount of oxygen.

It has already been mentioned that linseed oil or chinawood oil head the list of drying oils. The latter also contains a natural drier.

The other bold division of the oil class is found in that type of oil which drys down to a sticky residue that forms the binder. Some of the natural asphalt base petroleum oils of the south and west act in this manner, and in fact any oil from which a certain amount of volatile constituents can be driven out to leave a high melting point tar or pitch, can be classified in this way. We also have in the same class the oils made by dissolving a gum of resin in a petroleum product or neutral oil.

In order to cheapen some oils, many manufacturers introduce a certain percentage of resin dissolved in petroleum oil. Such an addition, however, slows down the drying action of the drying oil as it tends to exclude the oxygen from the oil at the critical point in the drying process, and oil of this kind really becomes a varnish and it is only by the addition of artificial driers that rapid drying can be effected.

Some of the oils belonging to this latter class will stand more abuse than other core oil on account of the fact that some of the pitches are not broken up readily at ordinary temperatures, and would resist a temperature of 500 or 600 degrees Fahr., finally coking, and still act as a binder provided the temperature does not go high enough to burn them with the oxygen present.

In many cases in the core oil trade the core oil maker has discovered that deficiency in oven design can, to a certain extent, be made by using certain types of oil binders of the class last discussed, and hence he supplies an oil suitable for these ovens, and later the foundryman improves his oven conditions and then cannot understand why the cores do not come out the same.

With properly designed ovens, and cores made from sharp sand and oil, some one of the high-priced drying oils has always been able to contend with all of the cheaper products of the dissolved gum class, but the sand must be properly mixed, and in many cases iron dryers or core pans are necessary to support the cores during baking. In other words, a given number of cents' worth of a high-priced oil, when properly used, will bind more sand than a corresponding value of a cheaper oil.

Core-drying practice, as it exists in most foundries, is simply a compromise, one set of conditions being juggled to meet another.

SILVERING BRASS.

A method of silvering that is applicable to such work as gauge or clock dials, etc., consists of grinding together in a mortar 1 ounce very dry chloride of silver, 2 ounces cream of tartar, and 3 ounces common salt. Then add enough water to make it of the desired consistency and rub it on the work with a soft cloth. This will give brass or bronze surfaces a dead white thin silver coating, but it will tarnish and wear if not given a coat of lacquer. The ordinary silver lacquers that can be applied cold are the best. Before adding the water, the mixture as it leaves the mortar can be kept a long time if put in very dark-colored bottles, but if left where it will be attacked by light it will decompose.

EDITORIAL

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CONTENTS

AMERICAN INSTITUTE OF METALS

As is told in the opening pages of this issue of THE METAL INDUSTRY, another convention of foundrymen has come and gone. The American Institute of Metals has again made history which will be recorded in its proceedings, which from year to year have grown from a small book to the current issue which is a volume of over 400 pages full of very valuable information. The quality of the matter presented before the sessions of the Institute at Atlantic City last week can best be judged by reading those of the papers which are published in this issue of THE METAL INDUSTRY. We believe that our readers will find them good. Anyone who reads them who is not a member of the Institute can be assured that they are only a sample of what the Institute provides and that it will be well worth his while to become a member and get the whole volume, which is valuable and important, if only for reference.

During a lull in the heavy artillery fire of scientific verbiage at one of the sessions last week MR. C. P. KARR started a discussion on a subject that has several times been referred, not only by ourselves (THE METAL INDUSTRY, November, 1913; September, 1914), but others and for a short time quite a sharp infantry battle ensued. This subject has to deal with the proceedings of the Institute becoming too technical for the average everyday foundryman to understand. MR. KARR'S original idea was to have such of the discussions of the Institute that would interest the foundryman at large printed in pamphlet form and distributed. The secretary reported that the present finances would not permit of this procedure. Following these remarks came some suggestions from several members, the gist of which gave birth to the thought that possibly too much science was being injected into the deliberations of the Institute for the soldiers in the ranks.

In casting about for methods by which to attract a greater number to the meetings, and incidentally to increase the membership, PRESIDENT CLAMER reported that the executive committee had thought of a plan, and it would probably be adopted next year. This plan is to have a day at least when the session will be devoted to actual shop practice and at which "shop talk" will be the language spoken. This, we believe, is the proper thing and we shall be very glad to see it adopted. Further discussion developed several suggestions whereby really scientific papers might be made a little more understandable to those not blessed with a university education. One of these sugges-

tions was to the effect that when chemical equivalents were used in a paper the common names should be put in brackets following the symbol as CU (COPPER), ZN (ZINC), SN (TIN), PB (LEAD), etc. In support of this suggestion, MR. KARR stated that the Bureau of Standards at Washington, D. C., in line with the above, had decided in future publications to put in brackets following metric system measurements their English equivalents. MR. BASSETT said that he was very sorry to hear of this, for he did not believe it to be good practice. He had introduced, for instance, Centigrade temperature readings in the works he was connected with and in a surprisingly short time everyone who had occasion to use temperature measurements thought, spoke and wrote in Centigrade. MR. BASSETT is right, if we are going to use chemical symbols, metric system and Centigrade scale, let us use them and not go about it half-way. The man who will not take the trouble to learn what they mean when he sees them will certainly skip them over when their equivalents are put before him in plain English.

In support of the above argument, we can cite the deliberations of the American Electro-Platers Society. A year ago these same things were as Sanscrit or Greek to a great many members, but now if one drops into the meeting-room of any one of the seventeen branches of this society he will find a blackboard filled with chemical symbols a great deal more complicated than any attached to the metals a foundryman has to deal with. He will also hear the members discoursing and using these symbols as though they had them for breakfast every morning. The European war has had a lot to do with our education in this way and it is surprising how quickly a great number of our everyday business men are becoming proficient in these heretofore foreign equivalents. If these men who have only lately found it necessary to adopt these terms, which they will use only occasionally, can do it, is it not much easier for a man to do it who comes in contact with them in his everyday work?

What the Institute does need, however, in our opinion is more papers and discussions on everyday foundry practice. A session or two could be devoted, as said above, to "shop talk" and then as problems are brought out and developed the scientific men could take them up with a view of solving them and translate the results in terms of simple language and the learning of the meaning of chemical symbols will take care of itself.

It was also suggested that the trade papers publish a glossary of chemical names for the metals and elements and any other equivalents deemed advisable. This has already been done a number of times by nearly all the journals devoted to the foundry. Moreover a complete list of all of these things is to be found in nearly every text book on chemistry, metallurgy or book dealing with metals, so we think that point has been well covered. The fact of the matter is that a great many men will have to be forced to educate themselves in this respect or be hopelessly left behind in the race.

One way in which the Institute of Metals could enlarge its scope and reach every phase of foundry work, would be to add another class of membership to its list and form branches as the American Electro-platers Society or sections as the American Electro-Chemical Society or the British Institute of Metals. These branches or sections could be made up of interested foundry men in various cities or zones convenient to a city and meetings could be had once a month or every two months. These meetings would be in hands of officers of these sections and the matter presented before these meetings could be at first of elementary educational character and what seemed important enough to be preserved, could be included in the monthly bulletin and finally bound in the yearly volume of the proceedings of the Institute as a whole. The financing of this extra literature could come from the funds provided by the dues of the branches. By this scheme it seems to us that there is no reason why the Institute could not double its membership and more than double its influence.

CORRESPONDENCE AND DISCUSSION

WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY

PROGRESSIVENESS IN THE JEWELRY INDUSTRY

To THE EDITOR OF THE METAL INDUSTRY:

Your valuable paper for September received. We have read with interest the article on "A Model Jewelry Factory" and desire to take exception to some of Mr. Hoke's statements, in that he states that the Jewelry Industry being exceedingly conservative, is slow to change its methods, machinery, etc. We differ, in that this statement is not true in our case nor do we believe in lots of the cases.

Since our establishment in a very small room with two workmen in 1875, we have moved six times—each time into larger and more improved quarters and on each occassion old machinery and methods were discarded and the new adopted. In the original days, we, of course, used for our stamping hand operated crude drop hammers. We replaced these with automatic drop hammers. Since our removal to our new address a few months ago, we discarded our automatic drop hammers for automatic screw presses. Originally a hand operated drop hammer produced about 500 stampings per day, our automatic produced 2,500 stampings per day and our present equipment of automatic screw presses produce 5,000 or more pieces per day.

For enameling, we formerly used gas furnaces with air attachments. We then replaced with gas furnaces which mixed the air and the gas. We have since discarded these for

electrical furnaces. This also applies to gold and metal melting. Formerly in treating steel we hardened according to color, today a pyrometer is used. We formerly could not melt platinum, but now it is a simple matter. We formerly were not able to collect our gold, platinum and other precious metals from our sweepings, but this is a very simple matter of today. Formerly in reducing or increasing the fineness of gold it was more or less guess work, today this work can be accomplished by our perfect scales. Formerly in weighing diamonds, the old carat weight was exact, today we weigh by the exact metric weight. Formerly we used the old 24-grain weights, today everything is accordingly measured by the decimal. Formerly all plating was done by the hand, today this is accomplished by automatic plating machines. Formerly gold dust which settled on the floor we lost, today we have arrangements so that the slightest margin of metal disappears, as we collect the floor dust through a vacuum process. Formerly in the polishing department the polishing from the metal disappeared in the air, today we collect it all through our dust collectors.

Formerly, owing to little being known about dies and tools, most everything was hand made and sawed out by hand, today practically everything is made by mechanical process. Formerly we used carbon steel for dies which was good for a few hundred impressions, today we use vanadium steel and according to actual records we recently finished a run of souvenir war fobs the die of which held up for over 100,000 compressions. Formerly in making gold and platinum diamond articles, such articles were made in separate pieces and soldered together, today such articles are made of one piece by mechanical process and the finishing requires very little hand work. Formerly we knew nothing of the art of Cameo setting or lapidary, all this work being executed in Germany, and today we have our own equipment and can duplicate anything in this line. Formerly all gold and metal rolling was done by hand, today this is a mechanical process.

In Mr. Hoke's article we note he believes the overhead motors and tools are an innovation. Our die cutters have been using this method for many years. Regarding hand blow torches, we have been using these for many years. In our factory there is no guesswork, we having an employee who figures exact time on each article when it proceeds through our shop.

We also have in our factory an inspection department and each article is carefully examined. We have in the front of our establishment a service department and have had for a numbers of years. We have a traffic clerk, as we do so much repair work for the trade, and such work sent to us we must return the day we receive it and our traffic employee's position is not only to see that the work leaves our factory the same day as received, but he has complete train schedules of all roads leaving Cincinnati so that any particular customer's work is shipped so as to reach a certain fast train.

In our new factory we think that even any great improvement would be worthy of stating. Although we have more employees than we had in our old plant, still our new plant was made out for efficiency. Our thought was not original, the writer having often visited the Ford plant in Detroit and noting their tracks, wherein, as the automobiles proceed, additional parts are added, so that at the finish of these tracks the automobile is complete. We have laid out our factory accordingly, so that each department is in rotation. The same number of employees as we formerly had, owing to this method, have increased the efficiency of our plant about 10 per cent. We could, of course, proceed to write pages of the improvements that have taken place in jewelry industry. We are not trying to take exception to Mr. Hokes' article, but we do not want, however, the impression to prevail that the jewelry industry has stood still.

The Gustave Fox Company,
Leonard James Fox ,General Manager.
Cincinnati, Ohio, September 16, 1915.

To The Editor of The Metal Industry:

I regret that Mr. Fox has interpreted my remarks to mean that the jewelry industry has no progressive firms. Indeed there are many, in all parts of the country, and if it were possible I would be happy to name them all. Moreover under the stimulus of the present sharp competition the proportion of progressive factories is increasing, as he suggests. No doubt your readers would be glad to see illustrations of the Fox factory and its equipment.

We must not be led into thinking that because certain firms are progressive, that the industry as a whole is. It has been my fortune to visit many factories, and to receive descriptions of their equipment from the heads of others. Most of these were plants producing platinum and gold jewelry. And—though I may be unduly pessimistic—I have found the average shop to be unprogressive. While many were good, many were extremely bad; the average is distinctly unprogressive.

Mr. Fox is quite right in saying that the dentist's motor is not an innovation. It has been used for some time, but still is in relatively few factories. The innovation in this connection in the Traub plant is simply in the manner of hanging, which is such as to permit almost instant removal of the motor for repairs. Needless to say, much of the Traub equipment is used in other plants—it does not claim to be wholly unique. But in its spirit and enthusiasm for progress it is, I maintain, exceptional.

The general impression that a visitor gets from the average jewelry factory is a compound of dirt and makeshift—the average factory, mind you. Dirt on floors and walls, and makeshift tools and utensils.

I have seen factory floors from which you could scrape grease and gold with your fingernails. I saw a factory clock that had been without its glass door for thirty-five years. Ancient kitchen ware serves in most electroplating and refining equipments. I have seen unhooded polishing lathes within three feet of the coloring baths, spattering rouge and gold impartially over operator, floor, finished work, and into solutions.

Dynamos are hung directly over furnaces, where they promptly become overheated and caked with dirt. Furnace temperatures are almost wholly judged by the workman's eye. Voltmeters, ammeters and other instruments are either absent or improperly used.

I have been in a factory where a man unable to read had charge of the gold melting and platinum-and-gold refining; he determined which chemical to use by its odor and "looks." Some manufacturers have their refining work done in unheated additions, summer and winter; others work their men alongside of charcoal melting furnaces in summer. I have seen a boy trying to refine mixed filings without running water, without a gas burner or other artificial heat, without means of carrying off fumes, and actually without a table to work on—his motley collection of bottles and cracked china sitting on the acid-soaked floor. This was in a shop that was well rated financially. Few shops have running water, a gas burner, AND a hood, all three together, for their refiner. Most of all, I have seen dirt. Dirt under the benches, around the sinks, behind barrels, in the furnace rooms. Dirt in solutions, dirt in the chemicals, dirt among the tools and dies. However, these horrors are neither so interesting nor so instructive as the descriptions of good practice and good equipment, and my hope is that other factories beside the Traub and the Fox plants will be described and pictured in your pages.

C. M. Hoke.

New York, September 24, 1915.

NEW BOOKS

THE ANALYSIS OF NON-FERROUS ALLOYS. By Fred Ibbotson and Leslie Aitchison. Size 6 by 9½ inches. 230 pages, including index. Several illustrations. Bound in boards. Published by Longmans, Green & Company. Price $2.75. For sale by THE METAL INDUSTRY.

The aim of this book is to include within two covers the methods of analysis for the non-ferrous metals and alloys which, in the author's opinion and experience, combine as far as possible in the highest degree two aims, first, accuracy combined with convenience, and secondly, accuracy combined with speed. It has also been attempted to make possible the estimation of one element without the tedious separation from every other element usually found in other text books. The work is well worth the attention of metallurgists and analysts as it sets forth the very latest data pertaining to chemical analysis of metals.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

CASTING

Q.—In a casting we are making we are having trouble with blow holes at the center of the risers. The risers do not shrink at all, but rather puff up. Do you think we use too much manganese copper, ¾ of a pound to a hundred pounds of copper. What can you suggest?

A.—When the risers and gates of a copper casting do not shrink properly but rather puff up, it is a proof that the copper is not deoxidized. It is a good plan, before pouring your castings, to pour a test piece. A small cylinder molded upright in an open sand mold will be found convenient.

Melt copper hot, using good ingots and plenty of charcoal as a cover, then add 3 or 4 ounces of 10 per cent. silicon copper and pour the test piece. If it is all right the castings can be poured. If the copper rises in the test piece add 2 more ounces of silicon copper and pour a second test piece.

Manganese copper, if used in sufficient quantity to deoxidize copper, is liable to produce dirty castings or give a pronounced surface color that may be objectionable.—J. L. J. Problem 2,195.

Q.—If we are not exceeding our privilege will you kindly advise us what you would think of casting copper plates 4 feet long by 6 feet wide of two thicknesses, one portion of the plate is 1 inch and the other 9/16 of an inch, which prevents their being rolled. How near can this be cast from clear copper and what alloy would be most advisable.

A.—Copper plates are best made in copper molds, but it would not be feasible to make a plate of such a large area in this way, especially if a portion of the plate is only 9/16 of an inch thick.

It ought to be possible to cast plate in a vertical position using a dry sand mold. The thin portion of the pattern should be at the bottom and it could be chilled by setting copper plates in the mold, as this portion of the casting could not be fed by risers placed on top of the casting. The casting would have to be poured from the top like an ingot on account of the shrinkage, for if gated at the bottom it might crack. If you have a pit, a half a dozen of the plates could be rammed up and poured at one time.

About 2 ounces of 15 per cent. phosphor copper should be added to each 100 pounds of the copper used for pouring the plate.—J. L. J. Problem 2,196.

HARDENING

Q.—Is it practical to harden both the punch and die on press work for use in cutting brass and aluminum?

A.—The blanking or cutting dies used on comparatively thin stock, such as tin, brass, aluminum, copper, zinc and other metals are ordinarily hardened and tempered to suit the work and the punch is left soft so that it can be hammered up to fit the die when worn. This practice is generally followed for metals less than 1/16 inch thick that are not harder than iron or very mild steel.

After the end of the punch has lost its size it is upset by hammering. The punch and die are oiled and forced together, which causes the die to shave the punch to a close fit. If the die is dull it should be sharpened prior to this shearing operation. For some classes of work the punch is made hard and the die soft. Both the punch and die should be hardened when they are to be used for blanking stock 1/16 of an inch or thicker stock, no matter what kind of metal is used.—P. W. B. Problem 2,197.

FINISHING

Q.—Kindly advise as to how to obtain a rose gold finish by the pigment method.

A.—If the articles are made from metal other than brass, they should be brass plated and scratch brushed to give an even surface and then afterwards lacquered. It is advisable to use a tinted gold lacquer for the purpose.

After the lacquer is thoroughly dry prepare a rose pigment as follows: Dissolve orange chrome in turpentine until a thin fluid paint is produced, regulate the tone of the rose by adding small proportions of jewelers' fine gold rouge to the orange chrome. To every pint of the mixture thus prepared add about 1 ounce of turpentine copal varnish as a binder for the color. When the pigment is thoroughly mixed apply to the previously lacquered surface with a brush and in a few moments the color will be ready to wipe out with the use of rags moistened with a mixture of equal parts of linseed oil and turpentine. Avoid adding too much varnish to the color or it will be sticky and when the color does not adhere properly a little more varnish is required. The rose gold color should dry out flat without any lustre.—C. H. P. Problem 2,198.

MELTING

Q.—We wish to ask if you can advise us the shrink we should expect on the following scrap metals in melting, copper 90, tin 5 and lead 5; copper 65 and spelter 35.

A.—We should say that the shrinkage that you should operate on in using the scrap metals that you mention are for the first mixture, viz., copper 90, tin 5 and lead 5; for light scrap 1.5 per cent. and for heavy 1 per cent.

For the second mixture, copper 65 and spelter 35; for light scrap 3 per cent. and for heavy scrap 1.5 per cent.—K. Problem 2,199.

MIXING

Q.—Can you give us a phosphor bronze mixture that will stand a 100,000-pound compression test with a reduction of not more than 5 per cent. per square inch? Kindly give us the proper method of melting this mixture also.

A.—"D" Phosphor Bronze, which is used for plungers slides and valves, is about the hardest phosphor bronze alloy that has enough toughness to alloy it to be safely used. It consists of:

Copper	70.50
Phosphor copper, 15 per cent.	15.
Tin	15.50

I have no compressive tests on this bronze, but "A" Phosphor Bronze (7.25 per cent. tin) only has a compressive ultimate strength of 42,000 pounds. Hence it is not surprising that you have had difficulty in meeting a specification of 100,000 pounds at a 5 per cent. per square inch compression.

In making the "D" Phosphor Bronze melt the copper hot, add the phosphor copper and finally the tin. The metal should be kept well covered with charcoal to prevent oxidation; pour into ingots for remelting and cover each ingot mold as soon as poured with an iron cover or a pine board.

If your mixture to meet the 100,000 pounds compressive strength does not have to be a bearing bronze you might try manganese bronze or aluminum bronze. These alloys, if cast in chill molds, are very strong and stiff.—J. L. J. Problem 2,200.

OXIDIZING

Q.—Do you know of anyone using red lead for an oxidize on metal, or if it can be used to advantage on same?

A.—There are a number of concerns who use lead salts in connection with sodium hyposulphite for producing oxidized effects upon silver, brass and copper. The lead salts consist of sugar of lead and litharge, and we see no reason why red lead could not be used for the same purpose.

We would suggest that the following proportions be used:

Water (180 degrees)	1 gallon
Sodium hyposulphite	1 pound
Red lead .....2 to 4 ounces	

Immerse articles of copper or brass or plated with these metals, also silver, for a few moments or until a gray black is produced. The relieving for antique effects is accomplished in the regular manner.—C. H. P. Problem 2,201.

PEELING

Q.—We are experiencing trouble with the plate on name-plates peeling off when placed under the hydraulic press in order to engrave it. The plate is copper-plated and subjected to liver of sulphur to give it the oxidized finish and then scratch brushed. Can you advise us how to overcome this difficulty?

A.—We are of the opinion that the trouble with the peeling upon the name-plate is due to two causes, either the surface is not clean and free from oxidization or the copper solution is deficient in cyanide, which causes the hydrogen to deposit with the metal producing the peeling as noted. Providing the articles are chemically clean before plating, we would suggest that 1 ounce of cyanide mixture (98-99 per cent.) and ½ to ¾ of an ounce of ammonium carbonate be added per gallon of solution. This addition will overcome the difficulty due to the occlusion of hydrogen, which we believe causes the trouble.—C. H. P. Problem 2,202.

PLATING

Q.—Will you kindly give me a receipt for a bright nickel on lead and spelter work? The pieces are bright before plating. I have a bright nickel, but it has a dark cast.

A.—It is somewhat difficult to produce a bright deposit upon spelter or lead from the ordinary nickel solution and no addition can be made to produce these results other than boracic acid. If sulphuric acid is used the spelter will be more readily acted upon and the black streaks will show up more quickly than in a solution that is neutral or slightly alkaline.

We suggest you try the following formula for your purpose:

Double nickel salts.....	8	ounces
Magnesium sulphate (epsom salts)..	2	"
Sulphate of iron.....	½	"
Water	1	gallon

C. H. P. Problem 2,203.

RE-MELTING

Q.—Will you kindly advise what the best disposition can be made of nickel deposit that collects on fixtures which are used for handling work in nickel tanks? We peel the nickel off of the fixtures and obtain it in flakes. It has entered our minds that the nickel can be melted and cast over for anodes. The scrap that we get has a slight deposit of copper.

A.—If you have good facilities for re-melting your nickel scrap you might melt it down into ingots and then sell it for the nickel it contains, but we do not believe that you would be able to use it for nickel anodes if it contains, as you say, copper, for, as you know, nickel anodes which contain copper are apt to cause streaks in the deposits.

The melting and handling of nickel for anodes is quite a proposition and we do not believe that you have enough of this material to make it pay to go into it, so our advice would be to sell the scrap on the analysis of nickel content.—K. Problem 2,204.

RUSTING

Q.—We would be pleased to have your idea as to why steel curtain rods should rust as they do when they are cleaned with caustic soda solution and dried off in sawdust. The only way we can get around this difficulty is by rinsing off the grease in benzine and then drying in sawdust, but are anxious to do away with benzine and would welcome any advice on this subject whereby we can accomplish this end.

A.—There is only one answer to your question and that is the rods carry moisture to the sawdust. When the sawdust becomes impregnated with the moisture the rods cannot be perfectly dried and the moisture then produces rust.

In cleansing with benzine you have a grease solvent that contains practically no moisture, therefore, the sawdust remains free from moisture and no rust develops, because the rods are perfectly dry. In the steel wire mills a hot solution of lime water is used for the protection of rust and this must be strong enough to give a thin coating of lime.

If black platers' compound was added to the boiling rinsing water in the proportion of two ounces per gallon the rods immersed in this solution and drained well before drying out in the sawdust would be protected from moisture by the thin film of grease that would be left upon the rods from the compound solution. This almost invisible coating would in no ways affect the plating of the rods.—C. H. P. Problem 2,205.

SOLDERING

Q.—Would you kindly inform us which is the best way and what to use to solder Bessemer steel so that it will be mitred clean and ready for gold plating?

A.—Bessemer steel may be hard soldered or brazed very successfully by the use of manganese bronze with a flux of borax. This makes a much stronger joint than ordinary spelter. The excess of borax may be removed by means of boiling water and the articles copper plated and then gold plated in the usual manner.—J. L. J. Problem 2,206.

Q.—Will you kindly give us a formula for an inexpensive quick flowing silver solder, one costing not more than fifty cents per ounce? It is not particularly necessary that it be silver solder but one which is quick flowing like silver solder and that can be used on rolled gold plate jewelry.

A.—The following composition will give you a free flowing silver alloy solder, which should prove satisfactory for your purposes and should cost less than fifty cents per ounce, upon the basis of the low price of metallic silver at the present time:

Silver	80	per cent.
Copper	2½	" "
Bertha spelter	17½	" "

C. H. P. Problem 2,207.

TUMBLING

Q.—I am nickel plating iron screws by the tumbling barrel system and am having trouble in getting the slot and threads of the screws to look nice and white. My regular solutions run white and fine, but the screws seem to have a yellowish cast. Can you help me out?

A.—In mechanical plating to produce equally as good results as in the still bath the solution should be twice the strength or nearly so. For instance, a still bath may stand at 5½ degs. Baumé, but a mechanical bath should register not less than 10 degs. and the voltage should be increased in proportion. You can probably assist your present bath by increasing the conductivity; add 1 to 2 ounces of sal ammoniac to each gallon.

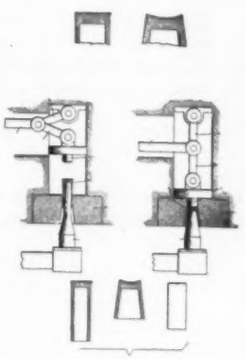
The yellowish tone may also be due to the method of drying out, which sometimes produces a yellowish tone. In connection with your drying out bath use a whale oil soap solution maintained at nearly the boiling point, using 4 to 8 ounces of soap to each gallon. Dry your screws out directly from the soap solution without immersing in water after the first rinsing.—C. H. P. Problem 2,208.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY

1,151,222. August 24, 1915. **Process of Drawing, Forging or Swaging Hollow Metal Articles.** Wm. Scrimgeour, Portsmouth, Va.

This invention relates to a process of drawing, forging or swaging hollow metal articles, such as the casings for projectiles.



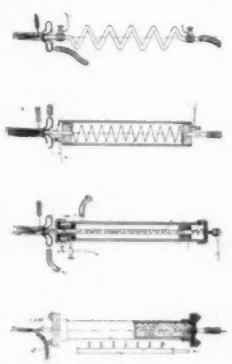
In making articles of this character it is desirable that the operation of drawing, forging or swaging shall be so conducted as to leave the blank of a shape approximating as closely as may be the final shape of the completed article, in order that there may be little finishing work required, and that no metal need be unnecessarily removed.

In order to attain this result the blank is so shaped that additional metal is provided at those places at which, in the operation of forging, swaging or drawing, the metal would tend to be withdrawn or displaced.

The invention will be readily understood from the accompanying drawing.

1,151,586. August 31, 1915. **Apparatus for Melting and Spraying Fusible Substances.** Franz Herkenrath, of Zurich, Switzerland, assignor, by Mesne Assignments, to Metals Coating Company of America, of Boston, Mass., a corporation of Massachusetts.

The object of this invention is to provide improved means for melting and spraying fusible substances, such as metals, for the purpose of coating surfaces therewith.



To this end the inventor uses a stream of heated gas, in the path of which he places the fusible substance, the temperature of the gas being sufficiently high to melt the substance. The function of the gas is thus in part analogous to that of the blow pipe flame used in some forms of the so-called "Schoop" process, but the gas also has a propulsive effect on the molten substance, and thus effects the spraying, or assists in that operation. In general he finds it more economical to use, in addition to a stream of heated air or other gas, whereby the substance is melted, a blast device acting in conjunction with the said stream of gas. Four embodiments of apparatus suitable for carrying this improved method into effect are shown in the accompanying drawing.

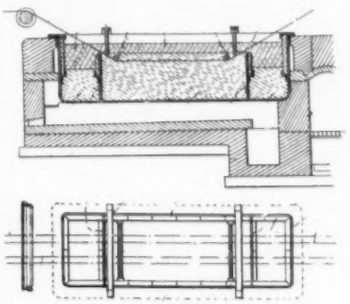
1,151,744. August 31, 1915. **Alloys or Compounds for Improving Copper and Its Alloys.** Charles Vickers, of Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Company, of New York, N. Y., a corporation of Maine.

The present invention relates to means for purifying, and thus improving, copper and its alloys, including brasses and bronzes. The inventor claims as new, the ternary alloy of copper, titanium and magnesium; and a new article, an alloy comprising copper, less titanium than copper and less magnesium than titanium.

1,151,629. August 31, 1915. **Galvanizing Bath.** N. K. Turnbull, Manchester, England.

This invention has for its object means for insuring that wire, strips, sheets or like objects may be galvanized without passing through an accumulation of impure spelter or dross, and is adapted for use in baths where zinc is superimposed on a metal of higher specific gravity, such as lead.

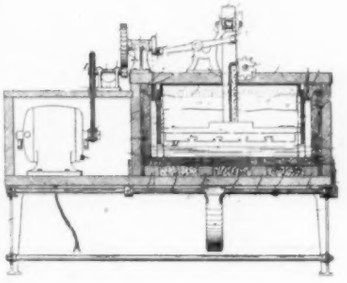
Baths containing only molten zinc are in general use, even though it is recognized that excessive losses take place due to the formation of hard spelter or dross (by contact of molten zinc and iron) produced by the more or less rapid deterioration of the bath and of the guides, forks and rollers therein, and by the material itself being wholly in contact with molten zinc during its entire passage through the bath.



Now the present invention differs from these and any known efforts by heating the spelter solely through the lead, and in insuring that while the material being galvanized passes through a very limited path of spelter it still enters and finishes through spelter having a substantial depth. This is a matter of prime importance, as only with a fair depth of zinc is the purity of the top layer of spelter secured, and at the same time the material passes preferably at an angle over the end chambers containing a fair depth of zinc, and close to the partitions into and out of the central lead chamber, in such manner that the impure spelter formed falls vertically, as is shown in cut, and is collected in said chambers, below the path of and away from the material being galvanized. These end and specially arranged chambers or receptacles at the ingoing and outgoing ends have sufficient capacity to receive any desired quantity of dross, so as to enable the work to proceed for a considerable time, such as a week, without interruption.

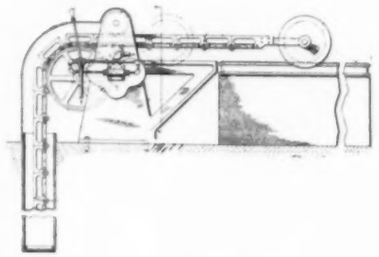
1,152,435. September 7, 1915. **Etching Apparatus.** Robert R. Page, Brooklyn, N. Y.

This invention relates to a process for preparing metallic and grained plates for printing after the picture to be printed has been produced on the plate, and the apparatus for carrying out such process, as shown in cut. In this art, a plate preferably composed of copper is provided with a sensitive coating, and after the picture has been produced on such coating, then the plate is repeatedly dipped in a solution of iron perchlorid whereby the unaffected coating is washed off, and the copper surface where exposed is etched by the action of the iron perchlorid with such copper, and since the exposed copper surface may be extensive in part of the picture and in other parts almost imperceptibly small, the etching action will clearly define and bring out the affected parts of the coating, which is very desirable in order to clearly reproduce such picture in printing.



1,152,631. September 7, 1915. **Molding Apparatus.** W. H. Hoffman, Richmond Hill, New York.

The machine shown in the cut comprises a support for a pattern mold, a roller movable longitudinally over the mold to pack the sand therein and a rack and pinion for moving the roller, a stand being also provided for supporting the roller in inoperative position. When the roller is moved longitudinally to its inoperative position upon the stand the rack by which the roller is moved extends substantially its entire length beyond the stand and is so positioned that it is subject to injury and also not infrequently causes damage to other property or injury to the employees.

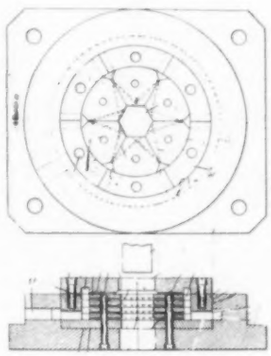


It is the principal object of the present invention to provide a construction in which there is no undue projection of the roller-operating mechanism beyond the roller stand, in any position of the roller.

With this object in view the invention contemplates the provision of flexible driving means for moving the roller, the flexibility thereof permitting the avoidance of the former excessive projection of the driving means when the roller is in inoperative position.

1,152,826. September 7, 1915. **Die for Planing Metal Articles.** J. Lundgren, Detroit, Mich.

This invention relates to a die for planing or shaving metal articles, and has among the objects thereof to provide a construction, as shown in cut, which will efficiently and quickly plane the articles; to provide a structure that will simultaneously plane a plurality of faces of the articles; to provide a die that may be employed for planing articles of different sizes or different contour; to successively operate upon the article by a plurality of planing members; and further to provide a device in which the shavings or portions of the metal planed from the articles are automatically removed from the planing members or tools after each operation.



1,153,230. September 14, 1915. **Sand Mold and Method of Treating the Same.** Charles B. Jacobs, of Port Chester, New York, assignor to Murray and Jacobs Manufacturing Company, of New York, N. Y., a corporation of New York.

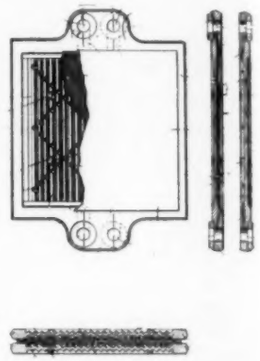
This invention relates to the production of sand molds for making metal castings, and it has for an object the production of mold surfaces, particularly molds formed of unbaked or "green" sand, which are adapted for forming those kinds of steel and other castings which ordinarily cannot be satisfactorily made in such molds because of the delicacy of the mold surface or some part thereof or because of the weight or erosive character of the metal or its tendency to flux with the material in the mold and form scabs or scoria or an objectionable crust on the surface of the casting.

In accordance with this invention, a cement is applied (that is, to the whole of, or a part of, the surface) of a sand mold and dried, said cement being adapted, when solidified, to make the surface of the mold hard and strong so that it will not disintegrate or be deformed by the eroding action of the metal flowing therethrough or by the weight of the metal, and will not unite with the metal so as to form scabs or scoria.

1,153,168. September 7, 1915. **Electrolytic Apparatus.** T. H. Levin, of Newark, N. J., assignor to International Oxygen Company, of New Jersey.

This invention relates to electrolytic apparatus and more particularly to a type of diaphragm apparatus especially adapted for use in the dissociation of oxygen and hydrogen entering into an electrolyte.

This invention relates more particularly to electrodes for use in such an apparatus, as shown in cut, and has for its object the production of such an electrode, or such an electrolytic couple for the purpose of increasing the efficiency of the apparatus, by so constructing and arranging the electrodes as to avoid the destruction thereof through corrosion.

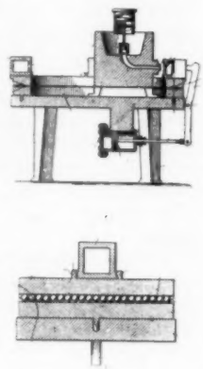


A further object is to so construct the electrodes as to minimize resistance to the electric current at the anode or cathode, thus increasing the effective decomposition of the electrolyte with a current of low voltage, and avoiding the necessity for excess voltage over that required in decomposing the electrolyte.

1, 153,749. September 14, 1915. **Die-Casting Machine.** James Bate, Detroit, Mich.

This invention relates to an improvement in die casting machines, and particularly to an improved rotary mold or die carrier whereby a series of molds may be supported in such manner that any mold may be brought into position to receive a charge of metal from the metal supplying part of the apparatus.

The object of the invention is to provide a casting apparatus, as shown in cut, including a rotary die or mold carrier adapted to detachably and interchangeably receive dies or molds for casting a variety of work, whereby different dies may be applied for use and removed when desired and any die for casting any particular article easily, quickly and conveniently brought into communication with the metal supplying nozzle for the purpose of making the cast.

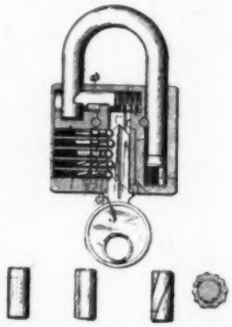


A further object of the invention is to provide a machine of the character described in which the dies when brought opposite the nozzle are adapted to be moved in position to receive the charge of metal therefrom by the action of a suitable die shifting device, operated by air pressure or other suitable means.

1,154,078. September 21, 1915. **Lock.** James R Upton, Peoria, Ill.

This invention relates to improvements in locks, and particularly that type of lock which is called a cylinder lock, utilizing pin tumblers to control the actuation of the cylinder in locking and unlocking.

The object in this invention is the provision of a construction permitting locks to be oiled without the possibility of the oil sealing the chambers in which the pin tumblers are mounted to move and thereby prevent their operation, due to the formation of an air cushion behind the pin tumblers.



Further objects reside in the improvements of the construction and arrangement, as shown in the cut.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

ADVANCE IN AUTOMATIC PLATING MACHINERY

By Mason Doyle.*

The plating industry, although over fifty years old, has only seen any practicable development in automatic handling devices during the past ten or twelve years. Perhaps one of the most well known pioneers in this field is Mr. L. Potthoff, president of the U. S. Electro-Galvanizing Company, 1-9 Park avenue, Brooklyn, who is the originator of the electro-galvanizing process. Until Mr. L. Potthoff, through the U. S. Electro-Galvanizing Company, first brought out automatic handling devices for electro-galvanizing different materials, the prevailing method was to string all articles to be treated by hand, or by hanging them on hooks or racks, and the plating was done in the so-called still tank. His activities have extended practically over the entire field. All mechanical automatic devices used for electro-galvanizing, can be, and are employed for any other kind of plating, such as, nickel, brass, copper, etc., the only difference being in the anodes and solutions.

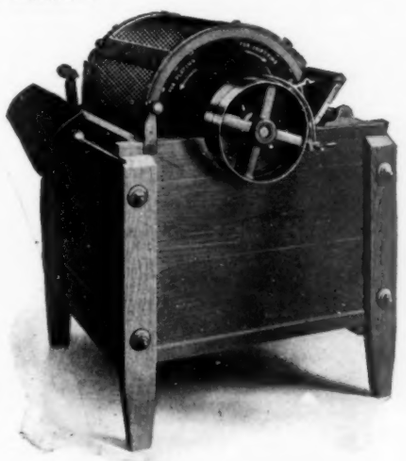


FIG. 1. BARREL IN POSITION FOR FILLING.

Among other apparatus Mr. Potthoff has invented a mechanical device for automatically plating and galvanizing elongated material, such as bar iron, pipe, etc.; a device for handling wire during the process of plating; another for automatically handling medium sized material in large quantities; and the latest product has been the automatic plating barrel, shown in cuts, for treating small material, such as nails, screws, rivets, washers, stampings, etc., in bulk. The entire equipment includes the plating barrel suspended on top of a tank and a machine in which the material is washed, after being plated, drained and dried.

The plating barrel is constructed of a specially compounded material which is similar to black hard rubber in appearance, but has almost the tensile strength of metal. The material is absolutely non-absorbing, and, therefore, non-conducting. This means much to the electro-plater, as it is a well known fact that in the wooden barrels much of the current is lost or side-tracked, owing to the fact that when they become saturated with the solution they are conductors. This material is also very tough; it is practically indestructible. This results in a great saving of repairs over that necessitated by the wooden barrels. Barrels made of this material which have been in use continually for the past three years show almost no evidence of wear.

The operation of this apparatus is simplicity itself.

The material to be plated is shoveled in the plating barrel by an unskilled laborer. Fig. 1 shows the barrel when filled. The starting lever is then moved and the plating begins. This automatically closes the door panel on the barrel. It is operated at a speed of from four to five revolutions per minute. The workman then places a receptacle at the end of the machine where the finished product is to be ejected. One operator can attend to three or four plating barrels. The time required for plating the material is from thirty to sixty minutes, depending upon the thickness of the coat required. An average coat can be applied in about thirty minutes. When the plating is completed, the operator throws the belt on the loose pulley. Two or three turns of the barrel in the opposite direction automatically empties the material into the receptacle or into the washing and drying drum. This is shown in Fig. 2.

If the material is delivered in a receptacle, it is afterward

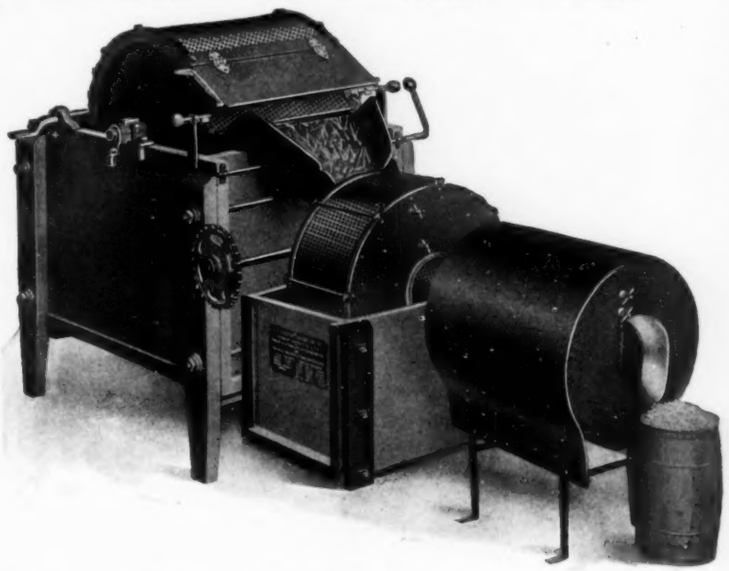


FIG. 2. AUTOMATIC "SELF-EMPTYING" WASHER AND DRYER ATTACHED TO U. S. JUNIOR PLATING BARREL.

This complete equipment discharges the work completed ready for polishing or shipment.

handled in the usual way, by drying the sawdust, etc., but if the washing and drying device is used, which is in direct connection with the plating barrel, the material is emptied into the washing drum of this device, the plating barrel filled and again started for plating, which also starts the washing and drying device. While the second batch is being plated, the first batch is automatically washed, drained and dried. In fact, if tumbling or polishing of material is required, the dried articles can be delivered automatically into a polishing drum, from where it is removed, completely finished. Therefore, all handling labor can be saved. It is only necessary, in this case, to shovel the material into the plating barrel and remove same from the polishing machine completely finished.

The washing and drying apparatus is constructed and handles the material in the following manner: It consists of three drums, namely, a washing drum, a draining drum and a drying drum. The complete batch, which has been delivered into the washing drum as the product is washed, is delivered a few pounds at a time into the draining drum and from there, also a few pounds at a time, it is carried into the drying apparatus. This is the last compartment of the machine and consists of a drum with an

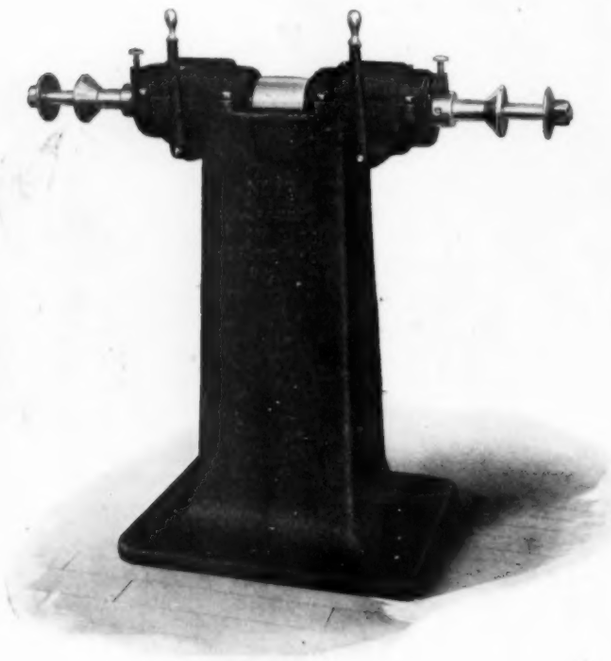
* U. S. Electro-Galvanizing Company, Brooklyn, N. Y.

inner separate cylinder. This device is not installed level but at a light incline with the emptying end lower than the loading end. The latter half of the inner cylinder is perforated.

As the material enters this drying drum it mixes with dried sawdust. The sawdust is carried forward with the plated material by means of the rotation and also by gravity, until it reaches the latter half of the inner cylinder where the sawdust is sifted into the outer shell. A gas burner is placed underneath the drying drum, which keeps it hot and dries the sawdust. The sawdust, after it is dried, is again carried, by means of pick-up pockets, to the entering end of the drying drum where it mixes with the new material coming in to be dried. The plated material continues its travel through the latter half of the drying cylinder and is ejected into a keg or other receptacle, which is placed there for the purpose of receiving it. By the time this second batch is ready to eject into the washing drum all of the first material has passed along. The machine is absolutely continuous in its operation. This method is so greatly superior to the old way of plating by the still tank that there is absolutely no comparison.

DOUBLE SPINDLE POLISHING LATHES

The Gardner Machine Company, Beloit, Wis., have recently put on the market a new double spindle polishing lathe. It will be noted that either spindle can be operated independently of the other, the advantages of which are obvious. Each spindle is mounted in two separate ball bearings of extra large capacity. Johnson clutches are used to engage spindles with driving pulley. Notice the device for locking a spindle when it is desired to back off nut for changing wheels. The button pin, held up by a spring is pressed down into one of the four holes in the permanently attached collar which is just outside of the bearing cap.



DOUBLE SPINDLE POLISHING LATHE.

At the present time the double spindle lathe is built only in the No. 3 size. The diameter of spindle at radial load is 2 inches; between wheel flanges, or arbor, 1¼ inches. The combined length of spindles from end to end is 50 inches. Total weight, 700 pounds. This machine is especially rigid and heavy, and the spindles run in perfect balance. A saving of 25 per cent. in power and a very material amount of time is claimed for this lathe. The manufacturers contemplate building lathes of this type in both smaller and larger sizes.

STEARIC ACID IN THE MANUFACTURE OF TRIPOLI COMPOSITIONS

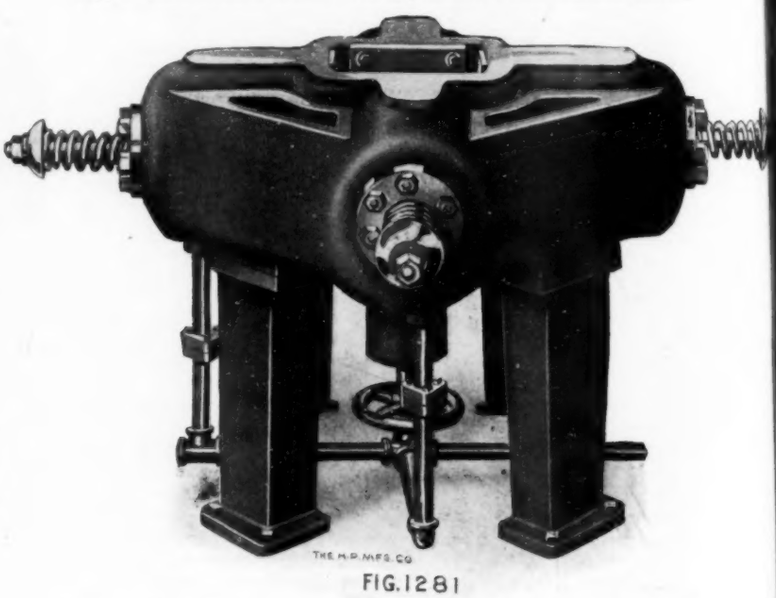
The price of this commodity has increased very materially since the beginning of the European conflict. It is largely used in the manufacture of the highest grades of Tripoli and white finish composition, and forms one of the chief ingredients. Due to its continued advancing tendency, it seems very evident that the price of good Tripoli and lime composition must be increased to meet the increased raw material costs.

In discussing this question of stearic acid with several of the largest manufacturers of Tripoli composition, it is advised that a movement has been started to form a company and erect a rendering plant by them for the manufacture of stearic acid (from its tallow basis) and in sufficient magnitude to take care of their own and some outside requirements. This would enable the Tripoli manufacturers to offer the best and most uniform product and at the lowest possible cost. As this proceeding is so obviously in line with the advancement of all chemical processes it is now undergoing a revision due to the changes caused by the European situation, it will undoubtedly be welcomed by manufacturers and users alike.

Members of the Metal Finishers Equipment Association which is primarily interested in the good and standardization of the industry speak very encouragingly of the project and will no doubt give it their enthusiastic support.

BANDING HYDRAULIC PRESSES

For finishing steel shells after they have been forged and drawn into shape, two hydraulic pressing operations are necessary; that of nosing the shell and then pressing or shrinking the copper band around them. The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, is building a number of hydraulic presses for both of these operations, as well as for the forging and drawing operation, for both United States and Canadian manufacturers who are engaged in the production of steel shells.



BANDING PRESS FOR PUTTING COPPER BANDS ON STEEL SHELLS, MADE BY THE HYDRAULIC PRESS MANUFACTURING COMPANY, MOUNT GILEAD, OHIO.

The nosing press is capable of exerting a maximum pressure of 150 tons. The press is solidly built, steel being used throughout in its construction. The press is operated either direct from an independent pump or from an accumulator system.

After the shell has been pointed the next pressing operation is that of shrinking the copper band around the base of the shell. For this operation this company is building a four cylinder horizontal press. The cut illustrates this press. The rams from the

four cylinders press in from four directions, thus pressing on four sides of the band at once.

To properly secure the band at all points the shell is turned two or three times. From 20 to 75 tons pressure is necessary for this work. During the pressing operation the shell is supported in the center of the press by an adjustable table or stand from beneath the heads of the rams.

The maximum pressure capacity is 75 tons. The press is operated from either an independent pump or from an accumulator system.

EXPOSITION OF CHEMICAL INDUSTRIES

During the week of September 20, there was held at the New Grand Central Palace, New York City, the first National Exposition of Chemical Industries that has ever been held in this country. While the idea of the Exposition was in a sense commercial, it had at this time an even broader meaning, as it showed, to a considerable extent, the chemical strength of this country. As the European war has brought very prominently to public attention our dependence on certain European countries for chemicals, the Exposition gave an opportunity for us to view our own strength in this particular.

A great deal has been written about our depending on European countries for aniline colors for all textile and commercial purposes. Accordingly a great deal of interest was shown in the exhibits of American manufacturers of dyestuffs. Also, much has been heard of the new explosives that are being used abroad, especially picric acid. The exhibit of Thomas Edison, showing carbolic acid and other raw materials that are used for manufacturing explosives was therefore very interesting.

Among the various exhibits that attracted attention, and of special interest to our readers, was the exhibit of the Celluloid Zapon Company. It was surprising to observe the amount of popular interest in finishes of this kind by people without technical knowledge. The Zapon exhibit was crowded at all times, and excited very favorable comment. Not only did they show the raw materials used for making lacquers, but also a number of enamel finishes, as well as the method of applying them with a spray. Very attractive samples were shown that had been finished with Zapon finishes, on various kinds of hardware, also on wood, real leather, artificial leather, etc. It would surprise anyone to see the multitude of uses to which cotton solutions are put in a practical way.

The Exposition was a success in every way, 69,000 people having attended. It is the present purpose to hold the Exposition again next year, when it will doubtless be held on an even larger scale than was the present one.

EXHIBIT OF CELLULOID ZAPON COMPANY AT CHEMICAL INDUSTRIES EXPOSITION AT THE GRAND CENTRAL PALACE, NEW YORK, WEEK OF SEPTEMBER 20, 1915.

PARKER RUST PROOF PROCESS

The Parker Rust-Proof Company of America, Detroit, Mich., have incorporated under a capital stock of $100,000 and are promoting a process for the prevention of rust on iron and steel. It is claimed that this process is extremely low priced compared to other processes, as it is not a coating or paint, but is a part of the metal itself.

The Parker Rust-Proof Company is establishing a number of branches, the first one of which is at Boston, Mass., under the name of the Parker Rust-Proof Company, 65 Bay street. Agencies are pending with New York, Connecticut, Pennsylvania, Ohio and Illinois. The officers of this company are as follows: Clark W. Parker, president; Wyman C. Parker, vice-president and general manager; Leslie H. Green, secretary and general sales manager, and Joseph G. Johnston, Fred E. Holmes, Ralph M. Dyar, E. C. Rauss and S. J. Lloyd, directors.

NEW ALLOYS OF LIGHT METALS

By C. C. Mosher.*

For the past year or more the Garford Engineering Company, Elyria, Ohio, have been conducting experimental work and producing new metal alloys knows as "Aero Metal." They have tried out this metal in a number of different fields, and claim that the results obtained have proven highly satisfactory for various uses. These alloys have been used to some extent in England, and the Garford Engineering Company is the first to produce them in this country.

Aero metal consists of various light metal alloys, the combinations being changed to meet different physical requirements, and the most important factor in the production of these alloys is the process that permits the alloying of metals that under ordinary conditions cannot successfully be brought into a true alloy. Another factor is the combination of different metals in the proper proportions and by the use of the necessary alloying agents to secure desired results for different purposes.

Among the desirable qualities attributed to these alloys are their extraordinary strength, light weight, and in some cases hardness, and in others toughness and, in fact, the various physical properties that can be secured in the different alloys through the patented process that makes possible the alloying of metals that have been impossible to alloy with the ordinary processes. Another special feature of some of the alloys is the non-corrosive qualities, as certain alloys can be made to permit of a combination that is not readily affected by the different corrosive agents. It is also claimed that the processes permit of non-ferrous alloys being made with much greater uniformity than is possible in the ordinary methods used in making aluminum and copper base alloys.

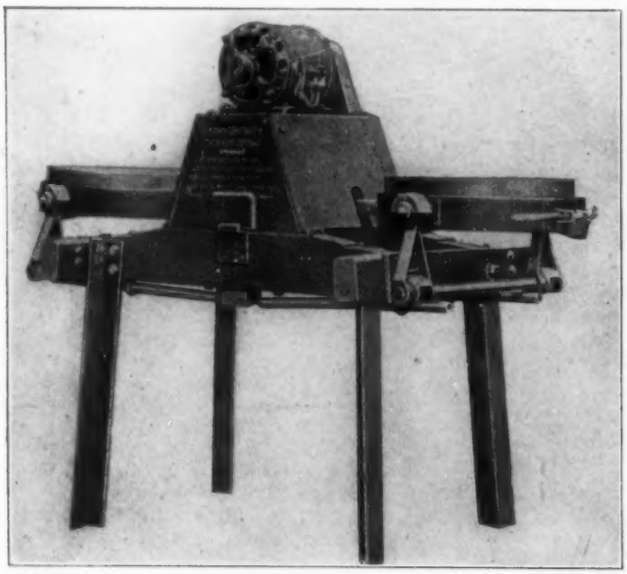
Considerable interest is now being shown by the automobile trade in Aero metal alloys for general use, and especially for pistons, as in the piston alloy, the specific gravity, strength and frictional properties are said to be secured to such an extent that

* Manager Garford Engineering Company.

a large increase of power is possible as compared with the use of iron pistons. The Garford Engineering Company is also about to produce what they claim to be a very fine bearing metal, consisting of large percentages of copper and lead. It is stated that tests made with this bearing metal, especially in racing automobiles, and for other bearings where there is very severe wear, have proved the metal of exceptional value for use in all kinds of bearings.

THE DUPLEX SHAKER

The Duplex shaker was designed and built by one of the owners of a large Chicago foundry, and was shown to the trade for the first time at the Foundrymen's convention at Buffalo, N. Y., 1912. (THE METAL INDUSTRY, October, 1912.) It attracted a great deal of attention at the exhibition and has been in active operation in over two hundred foundries ever since. The shaker has now been taken over by the Brown Specialty Machinery Company, who will in the future be the exclusive manufacturers and distributors. The machine as shown in the cut has a hardwood framework, giving more resiliency than steel or iron construction. Strong tie rods and bolts hold this frame firmly together and angle irons are used for the legs. The main crank shaft is steel, the fixtures on the bands for holding riddles are cast steel, and



THE DUPLEX ELECTRIC SHAKER.

the other pieces are cast iron. Jigs are used in drilling all holes. All parts are interchangeable. There are large caps covering all exposed bearings so that sand cannot get into the working parts. The two side bearings on the frame for the crank shaft are babbitted and bronze bushings are used on the two center bearings. The electric Duplex is equipped with a ¼ horse-power motor, a number of which of 110 or 220 volt d. c., or 225 volt a. c. single or three phase are kept in stock. It is claimed that the electric shaker will run 20 per cent. faster than any other shaker and will do twice the work—it will do the work of ten men and at minimum cost.

The Brown Specialty Machinery Company also build this shaker to run by pneumatic power, and this form differs only in using an air motor instead of the electric. Circulars may be had upon request from the Brown Specialty Machinery Company, Chicago, Ill.

CARE OF CRUCIBLES

The Joseph Dixon Crucible Company, of Jersey City, N. J., have issued a very attractive and serviceable card 7 x 9¼ inches in size, containing a number of important hints as to the care of crucibles. Copies may be had by addressing the above firm.

METAL FORMING MACHINE

The machine shown in Fig. 1 is manufactured by C. L. Frost & Son, Grand Rapids, Mich., and is designed for the forming of metals in various shapes, a few of which are shown in Fig. 2. This machine is manufactured in several

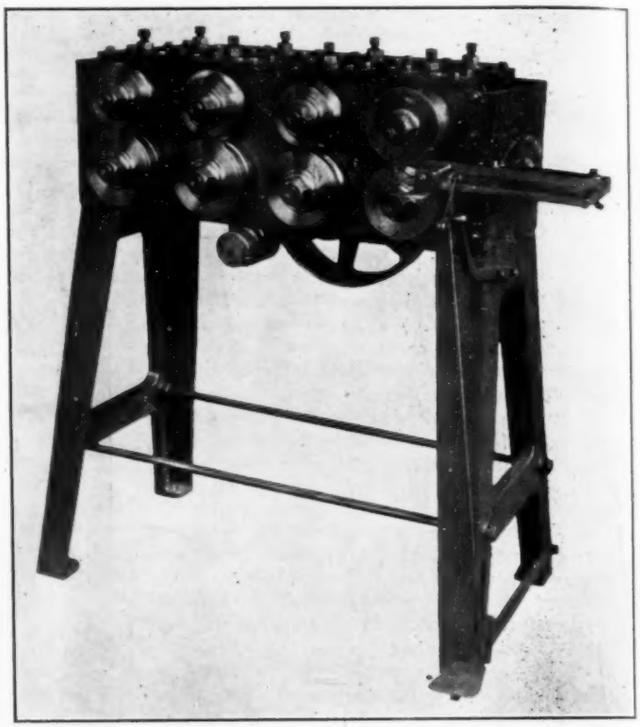


FIG. 1. THE FROST METAL FORMING MACHINE.

sizes and for the No. 1 or ordinary size, the floor space required is 32 x 48 inches and the rolls are 5 feet in diameter, giving, on forms such as illustrated in the cut, a production of from 4,000 to 4,500 feet per hour. The material to be formed is placed on a reel at the end of the machine and the forms comes out either straight or curved to any desired degree. The work is performed with a high degree of ac-

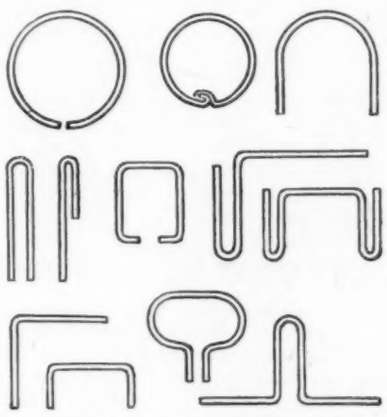


FIG 2. THE WORK OF THE ABOVE MACHINE.

curacy, and the machines have received much commendation. The eight rolls are driven by a combination of thirteen gears, all of which are concealed within the bed of the machine and which are provided with adjustments which operate through the set screws at the top to allow the use of varying gauges of metal. The treadle upon the front is to open up the gauges for the admission of fresh rolls of material, the operation of the machine being through the overhead beltshift, as on a lathe.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

AMERICAN ELECTRO-PLATERS' SOCIETY

New York Branch, H. H. Reama, president, and William Fischer, secretary, 345 East 23rd street, New York.

At its regular monthly meeting held on Friday, September 24, at 258 Pearl street, New York, Marshall E. Steward was elected to associate membership. After the regular business the laboratory committee gave an interesting lecture and demonstration on the preparation of a silver solution, showing the part that potassium and sodium cyanide plays in the making up of such a solution. The lecture will be continued at the next meeting to be held on October 8.

Newark Branch—Edward W. T. Faint, president, and George Reuter, Jr., secretary, 175 South 11th street, Newark, N. J.

The October rally of the branch was held on Friday evening, October 1, 1915, at their laboratory, 49 Bank street, Newark, N. J. Considering the unfavorable condition of the weather the meeting was very well attended, as even under these conditions forty members were present.

The meeting was called to order at 8:40 p. m. by President Faint. The regular business of the evening was left out to give more time to the speakers of the evening. President Faint then made a few brief remarks thanking the members for attending and welcoming the visitors, after which he described the object of the Newark branch in holding the rally.

The first speaker of the evening was George Hogaboom, of New Britain, Conn. He was given a most cordial welcome by the members. Mr. Hogaboom's subject for the evening was "The Advantage of Knowing Your Solution." He said the most important thing was to have the solution chemically correct and to keep it at a certain density most of the time. He then described some of his experiences with the brass solution and the results he had obtained. After he finished he answered a number of questions.

Cleveland Branch, Charles Werft, 331 Strathmore avenue, Cleveland, Ohio, secretary.

The monthly meeting of the Cleveland Branch was held on Saturday, September 25, at which a good attendance was present. Among the visitors of the evening was Charles H. Proctor, who gave a very interesting talk. This branch extends a welcome to all platers to their meeting to see and hear the good work the society is doing for the benefit of the platers. Plans are under way for an anniversery banquet to be held some time in December, the date of which will be published later. At its next meeting on Saturday, October 30, Mr. Fehren Wadsworth, of Elyria, Ohio, will address the branch on the Plating of Die Castings.

NATIONAL ASSOCIATION OF BRASS MANUFACTURERS

Commissioner Webster reports that the fall meeting of the National Association of Brass Manufacturers held at the Hollenden Hotel, Cleveland, O., on September 15 and 16, was a decided success in every way and if it lacked anything in numbers it certainly made up for it in enthusiasm displayed and matters accomplished. It reaffirmed its position in reference to blanket orders, stamping names on goods, taking orders for shipment further than 90 days ahead and the adherence to terms of 60 days net, 2 per cent. cash in ten days.

It amended its constitution, providing for a first and second vice-presidents and a poll of the meeting indicated that business is in a fairly good condition and while the plants were not operating up to normal in all cases a number reported they were. With the present strong metal market and copper holding at a level of about 18 cents with prospects of a good fall business, prices on the finished product would if anything be higher than heretofore. A prominent manufacturer, who is also a jobber, addressed the meeting, stating that, generally speaking, jobbers would not look with favor upon lowering prices for under present conditions it would not tend to stimulate or bring out business, but "cut prices" only harm the jobber as they reduce the value of his goods on hand and drive their values to a lower level which automatically reduces the total volume of business.

After a two days' session the meeting adjourned to meet in New York, December 8 and 9, which will be the annual meeting.

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

A. L. Burrows, formerly foreman of the polishing department at the J. L. Mott Iron Works, Trenton, N. J., has accepted a similar position with the Indiana Lamp Company, Connersville, Ind.

W. A. Locke has become connected as resident manager of the New York office of the Taunton-New Bedford Copper Company, manufacturer of copper and yellow metal, etc., Taunton, Mass., to succeed William H. Steele, who has been in charge of the New York office for the past twenty years and who retired on October 1. Mr. Locke has been associated with the sheet copper business for a period of over twenty-five years, which dates from his connection with the Ansonia Brass and Copper Company, Ansonia, Conn.

Russel A. Cowles has resigned his position with the American Brass Company and has been elected a director and vice-president of the Buffalo Copper & Brass Rolling Mill, operating a brass and copper rolling plant at Buffalo. Mr. Cowles has also been elected recently president of the Metals Trading Corporation, broker in copper and spelter. He became connected with the Ansonia Brass & Copper Company in 1893 and had been continuously in the service of that company and the American Brass Company, having been a vice-president of the American Brass Company in charge of the Ansonia Brass & Copper branch.

DEATHS

Lowell M. Palmer, president of E. R. Squibb & Sons, manufacturing chemists, New York, died Sept. 30 at Stamford, Conn.

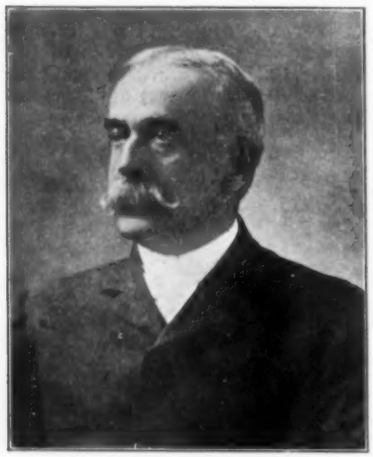
Frank P. Pfleghar, president and treasurer of the Pfleghar Hardware Specialty Company, New Haven, Conn., died on August 14, 1915.

John A. McNab, senior member of the firm of McNab & Harlin Manufacturing Company, Paterson, N. J., died at his summer home in West Oakland. Mr. McNab was seventy-one years old.

ABRAHAM VAN WINKLE

We regret to record the death of Abraham Van Winkle, president of the Hanson & Van Winkle Company, Newark, N. J., which occurred at his residence in that city on September 30 at the age of seventy-seven.

Mr. Van Winkle had been identified with the plating industry for so many years that his name was international in the annals of business. He retained his interest in the progress of the art until the very last. In proof of this interest the fact may be recorded that on September 23 Mr. Van Winkle called at the office of THE METAL INDUSTRY to inquire about the new process of leadising and to collect literature relating to the electrodeposition of lead. He was intensely interested in and worked unceasingly for the advancement of the plating interests and in January, 1910, he contributed a special article to THE METAL INDUSTRY on "The Development of the Electroplating Trade in the United States."



ABRAHAM VAN WINKLE.

Mr. Van Winkle was born in Pompton, N. J., October, 7, 1838, and was a descendant of an old Holland family. Three brothers of that name left the town of Winkel in North Holland in 1630. Arriving in the United States these brothers found their way along the Passaic and Hackensack Rivers and finally settled at a point near Belleville where they acquired land. One of the tracts in their possession is described in an old parchment deed dated 1728 and comprises all that tract of land running from North Newark including Passaic, Paterson and the Falls running from the Passaic River to the Orange Mountains. In about 1830 the parents of Mr. Van Winkle moved to Pompton, N. J., where Mr. Van Winkle was born.

While a young man he entered the drug business and between 1850 and 1860 he was a clerk in a drug store on the southeast corner of Market and Mulberry streets. Later he purchased this store and also fitted up a similar place of business on Broad street, north of West Park street. On October 7, 1863, he married Matilda P. Guerin. There were three children, one only of whom survives, a daughter, wife of Edmund N. Todd, of Millburn, N. J.

Mr. Van Winkle was a traveler and there are few countries which have not been visited by him. He made it a point to see all the principal expositions which have been held and from each he has obtained ideas and impressions which practically reproduced have been of benefit to his country and the community in which he has lived Early in 1870 he became very much interested in the development of electrical science and associated himself with leaders in what has now become an important industry. Mr. Van Winkle, together with Edward Weston, was instrumental in the development of the first low voltage dynamo ever manufactured in the United States. This was a success from the first, taking the place of the inefficient and costly batteries then in use in the electroplating industry. This dynamo was exhibited at the Centennial Exposition in 1876 and was taken to England and France where it proved a success, it being the first practical low voltage generator ever placed on the European market.

Later he became associated with the Brush Electric Company, who were then building generators for electric lighting. One of the first installations was made in a hotel in Chicago. This was a success and later the Brush company and other concerns consolidated under the name of the U. S. Electric Lighting Company, which was the parent of the large electric lighting companies of today. Mr. Van Winkle also accomplished the first installation of electric light equipment on steamers in the New York harbor through the installation of a full lighting equipment on the steamers of the Iron Steamboat Company.

Mr. Van Winkle was a student, a man of high scholarly attainments and had a wide circle of acquaintances among scientists and those prominent in professional lines and his removal from active life will be keenly felt.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

OCTOBER 4, 1915.

September was an exciting month in this part of the State, for there were prospects when it opened that there would be serious labor disturbances involving the skilled help in the factories not only of Waterbury, but of the entire Naugatuck Valley. Ansonia had already had its strike started. The machinists of several shops there had struck for the eight-hour day and time and a half for overtime, much as the machinists of Bridgeport, and it was foreseen that the trouble was spreading to Waterbury. It reached here. The International Machinists Union organizer, Charles Sehl, organized upwards of 1,000 machinists, apprentices and helpers. They voted finally to strike for eight hours and on Monday, September 15, the machinists of the Waterbury Farrel Foundry & Machine Company numbering 185 men struck. They were not the entire force of the company, but the union felt that the others would follow suit. The machinists of the E. J. Manville Machine Company were called out immediately after. That ended the campaign. The strike terminated Monday, September 27, when the men of the Farrel plant returned to work, or as many of them as were still in town and acceptable to the company. There are some still out at Manville's but the plant is running. There was some trouble also early in the month at the plant of the Chase Metal Works and several employees quit. They also sought to intimidate others and a few were sent to jail for such disorders.

The reason for the failure of the machinists' strike is the fact that the Scovill Manufacturing Company and several others announced just before the strike talk became threatening that there would be a change in wages and time, by which every employee would receive a ten per cent. increase in pay. There were some departments of this plant working on an eight-hour basis and when even these were found to have been included in the schedule of raises, as well as the company's police force and every individual on the payroll besides, the strike sentiment received a solar plexus blow. Scovill's stayed at work.

At the Farrel foundry the personal popularity of the heads of the company and the democratic spirit of the institution, which has always been given credit for an unusually strong asset in the form of good will of employees, are more responsible for the failure of the strike than any other element. An amusing instance of the democratic spirit of local factories and the good fellowship between employer and employees, other conditions being equal, was furnished at the plant of the Rowbottom Machine Company. Skilled men are essential to this corporation and George Rowbottom, its head, worked up from the ranks himself. He knows men and ma-

clines. There was a great fanfare over the strike at his plant, from the union forces. It was to "cripple the shop," et cetera. A great crowd gathered at 9 a. m. of the day the strike was to be called. Shortly after 9 o'clock out walked three men with their tool kits. That was all. They've gone; the rest stayed and the plant is running along smoothly and all is serene. The story is that "the boss talked to the men right up to the time for which the strike was called and then they didn't have the heart to strike and kept right on working—all but three."

Organizer Sehl has claimed to have won great benefits for the machinists of the community by organizing them and has threatened, in letters to the press, that unless "blacklisting and slicing of piece work" is abandoned by the Waterbury factory heads there will be a strike, but the possibility of further trouble seems most remote.

Joseph Ettor, I. W. W. organizer, came here and had a branch of his society forming, but he decamped after the police stopped one of his meetings and told him to leave town and stay away. Luigi Galleani, an anarchist, also came here and started to talk, but he was given similar treatment and he has departed.

With the labor situation again serene there is only one story heard anywhere when the condition of business is inquired about. It is good. "If there are no more labor disturbances here," said one manufacturer, "this fall and winter will see one of the most prosperous periods in the history of this Naugatuck valley. The workmen are satisfied and if they are not upset again by agitators there will be plenty of business and plenty of work at good pay."

There is no great supply of labor and wages are good. Orders for all kinds of local products are coming in steadily, though not in large quantities, but there is no doubt at all of the return of generally prosperous conditions. It is still true that the business of getting out urgent orders for war supplies in the large plants is sending normal business to smaller concerns, but the prosperous condition of business is due chiefly to "regular customer" orders and not war orders.

The outlook for the next year or two, at least, for all local metal business is good. If there were a Republican administration or a Republican tariff policy there would be no cloud at all on the local horizon.—F. F. B.

DETROIT, MICH.

October 4, 1915.

Munition manufacturers have experienced no anxiety regarding proposed strikes instigated by German and Austrian sympathizers. While there has been some attempt to induce foreign employees to leave these plants, nothing of a serious nature has yet developed and none is expected. As forecasted a month ago, all lines of the brass and aluminum industry continue to show a steady increase in business. It is confidently expected these plants will operate to their full capacity during the greater part of the winter. War material is still being produced in great quantities, which, with the demand for automobile parts, keeps manufacturers well supplied with orders.

It is currently reported here that two or three of the greatest automobile concerns in one of the eastern states are planning to move to Detroit. If this is true this city will see a still greater demand for brass and aluminum.

The Paige Motor Car Company has now well under way a great addition to its plant on West Fort street, where, when completed, two or three thousand more men will be employed. It is also understood that this company will add to its brass and aluminum foundry. The latest equipment will be installed and a large number of skilled workmen given employment.

The Packard Motor Car Company has its new addition well along and probably will be using it within the next few weeks.

Dodge Bros.' motor plant has its new buildings about completed and employing fully 9,000 men. This concern also maintains a complete brass foundry, said to be one of the best in the country. At the present time skilled mechanics are in demand here, but common labor is plentiful and wages not of the best.

Manufacturers of plumbers' supplies report this line extremely quiet, but they are now largely engaged in producing other supplies and are not seriously handicapped so far as business is concerned.

The outlook for the fall and winter is good, but business will be almost entirely confined to the production of automobile supplies and war material.—F. J. H.

During the past month business conditions in the metal manufacturing line have been exceptionally good and the outlook is bright.

In regard to the general situation the automobile industry is unusually prosperous just now. The domestic demand for low-priced cars never was as strong and the foreign demand has taken care of the higher-priced cars, especially the motor trucks.

They are better in proportion to the population than in any city in the country. In a talk with John J. Whiel, secretary of the Employers' Association, he states during the first seven months of this year employment was secured for 23,541 men, which is in excess of the number placed in 1914.

Detroit is regarded as one of the best, if not the best, labor market in the country. Wages are on an average high and the men are treated with consideration by the individuals, firms and corporations furnishing the employment.

All copper and brass is affected directly or indirectly by the foreign orders. There is an increased demand outside of this, as stocks are being restored in various centers of the country.

The building of factories is going on every week and since there has been a general improvement of business throughout the country it is expected that there will be an influx of enterprises into Detroit.

The Aluminum Casting Company have started an addition to their plant of a machine shop on the north side of Dunn road, between Joseph Campau avenue and the city limits. The building will cost $20,000.

The brass plants manufacturing accessories for the automobile factories are running to their full capacity and shipping some of their goods to outside concerns.

The Metropolitan Manufacturing Company is now located in its new plant on Wight street. They make a specialty of metal stampings and automobile hardware and are running their plant with a double force.

The Detroit Copper and Brass Rolling Mill is running to its full capacity.

Vice-President Moran, of the Standard Brass Works, Wight street, reports their plant running to its full capacity.

The manufacturers of plumbers' and steam brass goods in this vicinity are doing a normal amount of fall business.—P. W. B.

NEW BRITAIN, CONN.

October 4, 1915.

At last the inevitable strike fever which has been rapidly spreading over the country has reached New Britain and hundreds of the laboring men, employed by the various metal manufacturing concerns, have become inoculated with the strike bacilli and have laid down their tools, leaving their work until, they declare, their demands for better pay and fewer working hours are granted by their employers. Already the strike, which was called first at the New Britain Machine Company on September 17 and then spread to the other concerns, has reached alarming proportions and on September 24 a disastrous riot occurred at the factory gates of the Corbin Screw Corporation in which three policemen were overpowered and beaten by the angry mob, two of them so badly that they will be confined in the hospital for many weeks.

All summer long the different manufacturies in this city have been booming with orders, many of them for either war munitions or for machines used by other concerns in supplying war orders, and the labor leaders hit upon this time as the psychological moment for calling a strike. The idea of the working man is that with the enrichening orders piled up in the various offices the manufacturers will be compelled to grant their demands in order to swell their own receipts.

At the North & Judd Manufacturing Company practically all of the molders have quit and the same is true at the Union Manufacturing Company. Landers, Frary & Clark is somewhat affected by the strike and some of the employees of the P. & F. Corbin and Corbin Cabinet Lock divisions of the American Hardware Corporation have stopped work, as have the molders at the Corbin Annex. Thus far, however, the Vulcan Iron Works and the Corbin Screw Corporation are the hardest hit. It has been necessary to completely close down the Iron Works until further notice, as practically all of the employees in the big foundries struck. It is feared that it may also be necessary to close down the Screw Corporation as well, because of the 1,860 hands employed, fully 1,200 had struck by Saturday, September 25. At the New Britain Machine Company it is the skilled mechanics who have stopped work and this plant is badly crippled. Where the plant has been working a night and day shift it has become necessary to combine the few loyal employees from each shift and work days only. In the Screw Corporation, however, a majority of the employees are foreigners of the more ignorant type and it is this class which has made all the trouble.

In almost every instance the demands of the strikers are for an eight-hour working day, five minutes' time in which to wash up, being paid on the company's time, and an increase in wages. Some of the men are also seeking a five days' schedule with six days' pay. The molders have demands of their own in which they demand a different rate of pay and assurance that the fact they have struck will not be held against them.

Through the efforts of the New Britain Chamber of Commerce the Hartford Auto Parts Company, of Hartford, Conn., has been brought to New Britain. This company will move to New Britain about November 1 with 300 skilled hands.

The Fafnir Bearing Company, which is at present rushed with orders, many of them for bearings used in machine guns and other war orders, has increased its capital stock from $200,000 to $500,000. The common stock shares have been increased from 8,000 to 20,000 at a par value of $25.

Late in the afternoon on September 25, when it seemed that the strike must compel the entire shop to close down, the officials of the Corbin Screw Corporation agreed to grant the demands of the grinders and polishers. Heavy sprocket grinders will receive a minimum wage of $3 per day and light grinders will receive $2.50. Truckers were also given twenty-five cents an hour.—H. R. J.

HARTFORD, CONN.

OCTOBER 4, 1915.

New plants or additions have been recently or are now being erected by the Pratt & Whitney Company, the Billings & Spencer Company, the Hartford Special Machinery Company, the Jacobs Manufacturing Company, the Hartford Machine Screw Company and the Whitney Manufacturing Company.

It is the opinion of prominent Hartford manufacturers that the outlook for the winter has never before been so promising as it is today, despite the fact that strikers have been causing some disturbances and are contemplating more strikes. At present, the majority of the shops are operating night and day in order to fill big war orders.

Forty metal polishers at Colt Patent Firearms Company factory walked out early in the month when their demands for increased wages and shorter hours were denied. President C. L. F. Robinson, of the company, says emphatically that no concessions will be made to the men.

About sixty-five screw machine tenders at the Atlantic Screw Company went out on a strike for a few days. They demanded a nine-hour day instead of the ten-hour schedule in which they had been working under; also an increase in wages. The strike was settled in about a week.

Ten employees at the local branch of the New Departure Company, of Bristol, walked out two weeks ago. They had demanded shorter hours and increased wages, but the immediate cause of their walk-out was the discharge of one of their fellow workers. They began a disturbance outside the factory but were removed from the premises by members of the West Hartford constabulary. Since that time, the hours and wages have been changed at the factory.

The entire force of the Abbott Ball Company, consisting of about forty men, quit the factory last week for the same reason that caused the other strikes. General Manager George E. Abbott says that he will close down the factory before acceding to the strikers' demands, despite the fact that his place is so rushed with orders that it has been necessary for the past several weeks to operate night and day.

The Auto Parts Company, one of the four tenants asked by the Colt's Patent Firearms Company to vacate Colt's West Armory, will move on November 1 to New Britain.

The Sterling Blower Company is installing its equipment in the building formerly occupied by the Hartford Foundry Company. The Maxim Silencer Company is now installed in a new factory building on Homestead avenue. A one-story addition to the Cushman Chuck Company's plant will be erected soon in the rear of the present plant on upper Windsor street, in order to provide space for the greatly increased output of the company. The building will measure about 60 by 130 feet and will be completed in a few days. It will be used for the manufacture of small tools.

It is reported that the Maxim Silencer Company is filling orders for Maxim Silencers for the German army, but President Hiram Percy Maxim denies the story, saying that the last consignment of gun silencers was sent to Germany two months before the war began.

The Colt's Patent Firearms Company is soon to begin the manufacture of the new Vikers rapir-fire gun, which has been used for many years in the United States Army. It is capable of firing 600 shots a minute and is fed by a belt holding 250 cartridges. At the quarterly meeting of the directors of this company held in September, a quarterly dividend of 2½ per cent. was declared, this being an increase from 1½ per cent. The regular rate of dividend was raised from 6 to 10 per cent. They also declared an extra quarterly dividend of 2 per cent., this putting the stock on an 18 per cent. dividend basis. Colt stock has been selling over 600.

A modern fireproof building of brick and concrete will be built at the corner of Franklin avenue and Goodrich street this month for the Asa F. Cook Company. It will provide 14,000 square feet of factory space and 9,000 square feet for the office department, drafting and show rooms. The cost is estimated at $40,000.—T. C. W.

PROVIDENCE, R. I.

OCTOBER, 4, 1915.

The month closes on a most unsettled and unsatisfactory condition of affairs in the local metal industry, because of the presence of professional labor agitators and the efforts that are being made through strikes, tie-up, etc., to unionize all the plants, secure eight hours a day and increase in wage schedule. The largest plant affected is the Brown & Sharpe Manufacturing Company with its 5,000 or more hands. The concern states that it will not submit to the demands of the union, has declined the services of the Federal Labor Mediator and asserts that it will not shut down. In its attitude it has the indorsement of the Rhode Island Branch of the Metal Trades Association. There has been no violence or disorder attending the strike, but both sides are apparently settling down to a long and stubborn fight.

Notwithstanding this industrial draw-back the machine shops and the makers of various machine tools and other metal products, and, in fact, the entire metal lines are still leading the State's industries. There is no apparent let-up in the call for machinery that is being made here, and as a result skilled hands are at a premium. Most of the plants are reported to be several months behind in their deliveries at this time, and all are rushing work through at a rapid pace.

For the first time in nearly a year the manufacturing jewelers and allied interests report a considerable improvement in business conditions, and there is an increasing demand for help from a large number of the concerns. Many of the firms are said to have secured sufficient orders to keep them busy through the holiday season, and the recently started campaign of education concerning the wearing of jewelry is said to be bearing favorable results and there is a growing sentiment that the

coming year will witness a general rejuvenation of the manufacturing jewelry industry. This will mean much to Providence and vicinity as there are estimated to be between 15,000 and 20,000 persons of both sexes, who are more or less directly connected as wage earners with this industry, the majority of whom receive better than an average wage.

The silversmiths are having no cause to complain over present business conditions. Whatever war business comes in their direction is giving added impetus to the stimulation of regular trade. Strange as it may seem, some of the silversmiths are doing considerable work directly or indirectly resultant upon the war, their plants being equipped with heavy machinery that is necessary for the getting out of certain metal parts. The last four or five months have proven busy ones for these people, and there are no indications of any cessation at present. In the meanwhile, the regular demands upon the silversmiths are increasing, and the fall looks very promising. In this line of work the last three months of the year are usually among the largest of the year, and the Christmas trade, if good, always makes up for any deficiencies which may have occurred during the less-favored months earlier in the year.

The Harris-Corliss Engine & Machine Company has been incorporated under the laws of Rhode Island to be located in this city, with a capital of $400,000 equally divided in preferred and common stock. This concern will engage in the manufacture and sale of all kinds of engines and machinery. The incorporators are Volney M. Wilson, Jr., of Barrington; Richard S. Aldrich, of Warwick, and Frank Gibson and Frank L. Hinckley, of this city.

The Jeanette Jewelry Company, Inc., with a capital stock of $50,000, was incorporated recently under the laws of Rhode Island, the incorporators being Robert C. Nickerson, Oswald H. Schmadi and Ralph C. Nickerson. The concern, which will be located in this city, is authorized to buy, sell and manufacture jewelry and silverware.—W. H. M.

ATTLEBORO, MASS.

October 4, 1915.

After a general stagnant condition of business which has lasted for a period extending over a year, the jewelry manufacturers in this section are now seeing signs of the return of prosperity which heretofore has been experienced. The western salesmen have begun to return home and as a general rule they have substantial orders, many of which are for the novelty lines, but which, nevertheless, show that jewelry is coming back and that it will not be long before the staple goods will again be in demand. The manufacturers are well pleased with the way things are shaping up and they are already planning for an active season.

The C. S. Bush Company, of Providence and Attleboro, who supply many of the local jewelry firms with acids, chemicals, lacquers, etc., report that their orders have begun to increase materially and that their business has shown more activity in the past month than it has during a year.

The shops as a rule are working full time with several of them running at night to catch up with orders. The Mandalian and Hawkins Company, Maintien and Wise Company, Attleboro Novelty Company and several others have hired extra help in the past few weeks.

It was reported that several business men in Attleboro had received inducements to turn over their factories for the purpose of making war materials but none of these offers have been accepted. At the meeting of the North Attleboro Board of Trade on September 16 a report was made by the committee which had investigated these offers and which had advised against the acceptance of them because of the fact that such a large amount of special machinery would have to be purchased. This machinery could not be utilized after the war orders ceased and a great deal of unnecessary expense would be created. The committee reported that if any permanency could be guaranteed to the business that it would be most welcome and that the manufacturers would do all in their power to bring it here.

Erik H. Green, a manufacturing chemist with a factory in North Attleboro, has more business than his facilities will allow and he is now looking for a larger building where he can take care of the orders which he has received. He has sought the co-operation of the North Attleboro Board of Trade and he will probably keep his business in town.—G. S. McK.

BUFFALO, N. Y.

October 4, 1915.

Prevailing non-ferrous metal trade conditions in this market are remarkable when compared with other trade activities. A more healthy tone of business, which is growing steadily, has not graced this market in months. Every firm, no matter how humble their position, have brightened up because of this possible apparent returning of "good times" which seems to be on the horizon.

With this renewed activity and demand for local work has spread a feeling confidence as to the fall trade. Some anticipate more activity than others but this is determined by the amount of work they have on hand and the number of inquiries they have received.

The National Bronze Foundry report that they have sufficient orders to carry them through until next April. To care for the increasing clerical duties Mr. William Marr, the manager, has appointed his daughter Ella as office manager. The bronze tablets recently cast by this firm for the city water department were accepted as satisfactory.

The Aluminum Castings Company have remodeled and decorated their entire plant on Niagara street which cost several thousand dollars.

Schnell Bronze Bearing Company report business as very good while the Unique Brass Foundry report that they have been doing some work for the Curtiss Aeroplane Company.

Every plater is very busy filling orders. A. F. Fries Plating Company say they are swamped with work while the Washington Plating Company report that in order to meet this coup they have been forced to enlarge their plant at least 35 per cent. They also report that within a few months they expect to add more space to their plant which space will be occupied by stamping and milling machines, where they will make their combination pliers. A newer and better private office has been added, also their clerical force has increased.

During the past few months the Buffalo Brass and Copper Rolling Mill has increased its rolling mill capacity 150 per cent. They are also building a new two-story office building near the mills and they also contemplate the erecting of a new boiler house.—G. W. G.

NIAGARA FALLS, N. Y.

October 4, 1915.

A steady improvement of trade conditions continue to prevail in the Cataract City. There is not a shop, foundry, plating works or non-ferrous metal manufacturer who is not increasing the volume of business each day. In fact it is said that business has not been better for over a year. This is attributed to constant influx of large numbers of inquiries and orders booked. While a large amount of the trade is local yet the majority of it is for other states and for export. And this state of affairs, it is believed, will continue for some months to come.

No foundry is more active at the moment of this writing, in this city, than that of the Titanium Alloy Manufacturing Company. Large orders from automobile manufacturers are keeping this firm working full capacity with some orders hanging over. And to meet this situation they have decided to double the capacity of their moulding shop. Their office force is to be increased also, and to take care of this extra help they will shortly convert their caretaker's 2½-story frame house into an office. This firm will have an exhibit at the Atlantic City Convention.

The Frontier Brass Foundry Company recently made a large number of pure aluminum pans 2 x 4 fet for the Niagara Electric Chemical Company with success. At the present time they are making contact plates for the Union Carbite Company.

A. H. Wright reports that he is swamped with plating work while the Niagara Searchlight Company have enough orders on hand to keep them busy until next April. The Spirella Company are contemplating the installation of a new mechanical equipment which will cost a number of thousand dollars.

The Carborundum Company are very busy and are hiring more laborers every day to meet the increasing demand.—G. W. G.

COLUMBUS, OHIO

October 4, 1915.

The metal market in Columbus and vicinity is unchanged from the previous month. There is a fair volume of business reported in all varieties, but it is nothing to jollify over at this time. The tone of the market, however, appears better and future prospects are improving right along.

One of the features of the market is the spotty condition. Orders appear to come in spurts followed by a period of quietude. On the whole there is a satisfactory trade when general business conditions are considered. Copper is a little firmer all along the line. Lead is weaker and tin is a little quiet.

Copper is selling fairly well in central Ohio territory. Scrap copper is quoted from 16 to 17 cents. Red brass scraps are selling at 13 to 13½ cents per pound and yellow brass scraps are selling from 11½ to 12½ cents per pound. Block tin is quoted at 34½ to 35 cents per pound. Zinc is unchanged from the previous month. Aluminum is rather scarce and as a result prices are ruling firm in every locality. It is now quoted at 33 to 34 cents per pound. Other metals are unchanged.

The manufacture of war munitions at many of the metal plants in the Buckeye State has stimulated the metal market to an appreciable extent. Many of the factories in other lines have been turned to the manufacture of shells and cartridges.—J. N. L.

CINCINNATI, OHIO

October 4, 1915.

The principal factor in the metal trades in this vicinity continues to be the great predominance of war orders, and business growing out of them, over the general run of normal industrial work. In fact, it may very well be said that war business has in some cases almost crowded out regular work, as the prices are generally high and the business is otherwise attractive. At the same time, it is also true that with the general industrial situation still somewhat below par, the various trades concerned would be working on much less than full time if it were not for the big volume of foreign orders referred to. Foundries and machine shops are in many cases working three shifts a day, while full time is the rule everywhere. Labor trouble is threatened, growing out of this unusual prosperity, as the unions, as usual, want to get their share of the profit. A referendum vote of all of the machinists in the city is being taken, to decide whether to strike in case a demand for an eight-hour day without reduction in pay is refused. If a strike should be called, as it probably would be in case of an affirmative vote, it would seriously interfere with the rapid handling of business, although the claim of the union men that 75 per cent. of the employees could be influenced to walk out is probably exaggerated.

A new company, which will be known as the Cincinnati Screw Company, has been incorporated with a capital stock of $100,000, to handle a screw business. The company has acquired the plants of the Victor Stamping Company and the old Cincinnati Screw & Tap Company, and is preparing to place them in condition to operate for its purposes. The properties cover 23 acres, with several buildings and a good-sized power plant. The company has announced that it will not undertake to handle any war orders, but will confine itself exclusively to normal business, employing about 100 men at the outset. B. B. Quillan, who is now connected with the Cincinnati Planer Company, will probably be made president of the company.

With a continuance of war business on its present basis, and prospects excellent for a complete recovery of domestic business, indications are that the coming fall is going to be one of the best which the metal trades ever experienced in this vicinity. If only the distillers arouse themselves and give the coppersmiths some business there will be nothing left to complain of.—K. C. C.

LOUISVILLE, KY.

October 4, 1915.

Metal working concerns of Louisville are doing very little business at this time, and there is not a great deal ahead, according to the general impression of the outlook, until the distillers' season opens up. Earlier in the year there was a good deal of hope that this might be earlier than it was during the year before, but when the distillers announced a curtailment program even more severe than that of the previous year hope fell.

In addition to the slack conditions in the business, the high prices of supplies have contributed, it is said, to limiting of the amount of work handled, those who are not urgently in need of this kind of service preferring to put their work off until a time when cost of materials will not run their bills to high figures.

Numbers of the members of the Louisville trade have been interested in the possibility of war orders of one or another kind and the Vendome Copper & Brass Works, Elmore Sherman president, is negotiating for a very juicy one. Mr. Sherman said that he was not at liberty at this time to say what the order included or to give any details respecting it, but he did say that if the company was successful in landing the contract, the plant would be kept rushing for the next two years. The plant is running smoothly at this time, turning out a number of small orders and finishing up contracts which the house has had in the South. A few minor improvements have been made at the factory to keep abreast of modern mechanical efficiency.

Speaking of war business, reports are appearing in the papers of the state that several of the larger manufacturing enterprises of Kentucky have been declining contracts for manufacture of shrapnel. One of these is said to have been the Hagan Gasoline Engine Company, of Winchester, Ky., and the Kentucky Wagon Manufacturing Company, of Louisville, also is stated to have declined to take an order for shells. Both of these orders would have involved radical alterations of the plants.

Although there is no unusual activity in that line, Albrecht Sons Hardware Company report that they are handling quite a number of small orders in their brass department.

The Louisville trade was distressed by the recent death of J. B. Stickler, Jr., junior member of the firm of John B. Stickler Company, 614 West Walnut street. Although nominally a plumber (the firm handling a large plumbing business), Mr. Stickler was one of the successful workers in copper, brass, aluminum, etc., in the city, and did a great deal of business with the dealers of the city in the way of fine workmanship in brass, copper, etc., having the confidence of the several large dealers in antiques.—G. D. C.

TRENTON, N. J.

October 4, 1915.

The big plant of the Jordan L. Mott Company was partially tied up by a strike of the brass workers during the fore part of September. The strike was the result of the management changing the working time from day to piece work. The brass workers claimed that under the new plan they would have to work harder and receive less pay and they suddenly quit their jobs. Other organized employees of the plant threatened to quit and tie up the works completely. Superintendent Lindemer at first refused to see a committee of the brass workers, but later sent for the men and announced that a change had been made in the piece work system and that they would be paid more wages. The night and day forces then returned to work and everything is working smoothly again. All departments of the plant are very busy and a prosperous winter is looked for. The hands working on war fuses can put in all the overtime they want to and many are taking the advantage of making good wages while the rush is on. More than 300 extra hands have been given employment since the company began working on war orders.

There has been a big improvement in the metal industry in this city during the past month, especially in the brass and copper line. General Manager Wherry, of the Skillman Hardware Manufacturing Company, reports that business has been very good during September. "We have been working all departments to full capacity," he said to a representative of THE METAL INDUSTRY and expect a very busy winter. We have enough orders on hand to keep running for six months and there will positively be no lay off during the winter months "One of the improve-

ments made by the company was the installation of electric power to take the place of steam-driven belts. This will also cause a saving when but few of the machines are run at a time. The boilers will be kept intact in case of trouble with electrical power. The Billingham Foundry and Machine Company has experienced busy times during the month of September. President Philip Billingham said: "We have been very busy for some time and I am thankful to say that the prospects for the fall and winter are very bright. We have several good sized orders on hand for a general line of ware."

The Trenton Brass and Machine Company is operating full time with all the old employees. The John A. Roebling's Sons Company is also feeling the better change in the times and branching out gradually. Brass bearings are being turned out at this plant in addition to the brass made for the other departments. Metal workers at the Ingersoll-Trenton Watch Works found it difficult to secure the regular vacations this year owing to the rush of orders. The company is also busy at its Waterbury, Conn., plant.

The Bechtel Engraving Company finds business picking up a little and expects to be busy during the winter. The McFarland Foundry and Machine Company is busy turning out brass and bronze castings. At the other local metal plants business is encouraging.—C. A. L.

NEWARK, N. J.

October 4, 1915.

Many manufacturers are reporting considerably improved business, and a number have gone on full time with such forces as they have. These number less, however, in many instances, than in normal times. Others, however, are hiring more help. Some concerns state that they have not experienced any improvement. Take the local industrial field as a whole, however, there has been a marked improvement within the past month. This applies to firms engaged in the various lines of the metal trade as well as to other branches of industry. Money seems to be a little easier than a month ago, though there is still considerable complaint in regard to slow collections. The outlook for the future is good, though there is hardly anyone who looks for anything approaching boom times. The general feeling is that business during the fall will be better than it has been for quite a while before. There are many, however, who feel that just as soon as the war is over there will be better business than this country has seen for a long time, if ever, and that the period of prosperity will continue over many years. Some express the opinion that there will also have to be a change of administration before the period of prosperity will truly begin. One line of business which has shown marked improvement is the jewelry business. This business was flat all through last winter, spring and early summer. It is not up to normal yet, but has improved so much that some jewelers are advertising for more help, whereas a few weeks ago there were many applicants for jobs, but not enough work to warrant hiring the applicants.

The Aggressive Manufacturing Company, manufacturers of metal goods at 473 Washington street, reports business quiet yet. The high price of brass and other metals, it is stated, is partly responsible for the present conditions, as the prices of the finished products cannot be advanced in proportion to the raw materials.

Baker & Co., Inc., manufacturers of platinum goods at Austin and Murray streets, report business slightly improved, but state that it is very hard to get a sufficient supply of platinum.

The Central Plating Company has moved from 44 East Kinney street to much larger quarters at Chestnut and Mulberry streets. The company does electroplating on all metals. Business is reported to be better and the outlook for the fall is good.

The Metal Plating Company, of 200 Fifth avenue, New York City, has leased some property in Elizabeth, with 350 feet frontage on Meadow street, and 600 feet on North avenue. It is said that a factory will be erected for the manufacture of metal boxes.

The Balbach Smelting and Refining Company is to build a large storage building at Avenue R. and Doremus avenue. It will be constructed of brick and steel, will be one story high, and will cover an area 80 x 235 feet. It will cost approximately $10,000.

Hugh Baxter, who purchased the business of the Morehouse Dalton Company from the Morehouse estate about nine months ago, and whose place at 34 Mechanic street was recently destroyed by fire, has moved to 353 Mulberry street, where he opened for business again on Monday, September 27, after having been closed for a couple of weeks on account of the fire. The name of the concern has been changed to the Hugh Baxter Plating Works. Letters have been sent out to the trade announcing the change of name and of location and telling of the new plant, which with its new equipment, is up-to-date in every way. The company does plating of all kinds as well as coloring of metals.

W. H. Bergfels, of the Newark Nickel Plating Company, rear of 38-40 Walnut street, states that there is a better tone to the market and things generally look more encouraging. His firm is doing more than it has been doing, but not as much as normally at this time of the year. Collections are still slow with his firm.—R. B. M.

SAN FRANCISCO, CAL.

October 4, 1915.

Prospects are for a brisk trade among the brass, copper and allied industries this fall and winter, due largely to the influence the Exposition has had in bringing in a large amount of outside money which is beginning to find its way into industrial channels. There appears to be a greater feeling of optimism among the founders and machine shops than has been noted in a long time. A number of the shops to keep up an appearance of being busy have in the past and even at the present time, taken work to do at prices that are ridicuously low and this condition must be remedied. With castings selling around 20 cents and prices on scrap ranging from 11 to 15 cents it can readily be seen that there is not much of a margin to work on. It is to be hoped that in the interests of the up growth of the industry on the coast that a better feeling of comity exists among the members of the trade.

Red brass scrap has been around the 12 cents mark during the past month and copper at 15 cents, being practically the same as the previous month. Zinc which touched low prices has rallied somewhat and is ranging around 8 and 9 cents. Yellow brass scrap prices at 11 cents.

The Pacific Brass & Bronze Foundry, 528 Folsom street, notes that business conditions are improving nicely, particularly in the machine trade on gasoline engine work. Propellers, bearings and bushing are the main lines in demand. This firm recently contracted to supply a ton of brass to be used in the concrete work on a bridge over the Pajaro river, for shrinkage plates. Collections are reported as slow.

The Oscar Krenz Copper & Brass Works, 431 Folsom street, reports business booming in the brass, copper and foundry departments. To take care of the call for copper goods it has been necessary to put on night shifts and to run Sundays, something unusual in San Francisco in this industry. Several new contracts are under way.

W. T. Garratt & Co. report business as picking up generally in founding and machine shop work and collections as fair.

The Pacific Metal Works, 153 First street, dealers in antimony, bismuth, aluminum, stereotype and linotype metal, copper and zinc, report conditions as showing a decided improvement particularly in copper sheets, the prices on the latter running 26¼ cents out of stock. The market on stereotype and linotype metal is slow and shows no signs of brightening up for the present. —A. A. W.

SAVANNAH, GA.

October 4, 1915.

The Lapping Company—A. M. Lapping, proprietor—has opened a plating plant at 204 Broughton street.

The Liberty Plating and Auto Repair Works, at 546 East Liberty street, owned by Charles T. Swenson, is doing general metal repair work, enameling, polishing, and nickel and silver plating.

The Kehoe Iron Works are erecting an entire new plant on the Savannah river, near the old plant, and it will be one of the most modern plants on the coast. It will cost about $75,000. The marine work will be extended and they will enlarge on the brass, bronze and aluminum lines. They expect to get in their new building about the first of the year.—H. S.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

A two-story brick addition is being erected by the W. & S. Manufacturing Company, Worcester, Mass., to its metal stamping mill on Hunt street.

The Bridgeport Crucible Company, Bridgeport, Conn., has awarded a contract for the erection of a one-story, 28 x 30 feet, addition to its crucible plant.

The Milwaukee Die Casting Company, Milwaukee, Wis., has had plans completed for a two-story building, 50 x 60 feet, brick and mill construction.

The Abrasive Materials Company, Bridesburg, Philadelphia, Pa., manufacturer of grinding wheels, are building an addition to its boilerhouse, to cost $1,200.

The Standard Brass & Copper Tube Company, New London, Conn., are building a new casting shop 30 x 70 feet, which, when completed, will be equipped with twenty casting fires.

The Occidental Sheet Metal Works, 1008 First avenue, South, Seattle, Wash., recently moved its shops to 544 Railroad avenue, South, where they have about four times the floor space that they formerly had.

H. Mueller Manufacturing Company, Decatur, Ill., manufacturers of plumbers' brass goods, have let the contract for a one-story factory, 66 x 152 feet, and the building is already under construction.

The Ross-Tacony Crucible Company, manufacturer of crucibles, Tacony, Philadelphia, Pa., in order to provide for increased business, has awarded a contract for the construction of a three-story brick addition, 35 x 72 feet, to cost about $7,900.

The Kokomo Brass Works, Kokomo, Ind., are contemplating the erection of two additions to its plant, one 211 x 55 feet and the other 66 x 132 feet. This company operates a brass, bronze and aluminum foundry, brass machine shop and tool room.

The Unique Brass Company, 25 Illinois street, Buffalo, N. Y., is having plans prepared for a foundry, 50 x 100 feet, one story and a machine shop, 35 x 85 feet, two stories, which it expects to erect, but they state they have not definitely decided when they will begin.

Foster Milliken, formerly president of Milliken Brothers, Inc., and later connected with C. T. Wills, Inc., has been elected president of the McNab & Harlin Manufacturing Company. The company's main office is at 55 John street, New York, and its extensive plant is at Paterson, N. J.

The Waterbury Brass and Bronze Bearing Company, Henry L. Silver and Henry W. Even, proprietors, has been organized to manufacture a general line of brass, bronze and aluminum castings, specializing in bearings and breakdown jobs, and will be located at 115 Maple street, Waterbury, Conn.

The Gueder, Paeschke & Frey Company, Milwaukee, Wis., tin and sheet-iron and enameled products, has purchased the plant of the National Blower Works, Milwaukee, Wis., to provide much-needed room. The National plant adjoins the Gueder works at Sixteenth street and St. Paul avenue.

The United Smelting & Aluminum Company, New Haven, Conn., report that with the completion of a two-story, 20 x 40-foot addition which they are building and with the installation of equipment they will have seventeen furnaces in operation for aluminum, having a total capacity of 6,000,000 pounds per year.

The Nolte Brass Company, brass founders and finishers, Springfield, Ohio, has let contracts for an addition to its brass foundry to cost $15,000 and which will double the floor space of their brass foundry. The building will be 50 x 210 feet, of steel and concrete construction and strictly up to date for foundry purposes.

The Keeler Brass Company, Grand Rapids, Mich., manufacturer of automobile hardware, metal specialties, etc., have commenced the construction of an addition to its plant, 150 x 200 feet, which will be used for cutting operations with punch presses and automatic screw machines. This company operates a brass and bronze foundry, brass machine shop, spinning, stamping, plating and polishing departments.

The Acme Die Casting Corporation, 35th street and Third avenue, Brooklyn, N. Y., announce through their treasurer, E. N. Wolf, that on account of the success which their corporation has met with for the past eight months they have found it necessary to increase their capital stock from $125,000 to $200,000. They have also contracted for more space and will double their present plant within the next four months, but are now in a position to accept new orders for prompt delivery.

The Cleveland Blow Pipe & Mfg. Company, Cleveland, O., announce that they are installing for the A. C. Williams Company, Ravenna, O., a dust collecting system for the removing of dust from sixty buffing, polishing and emery wheels, in which will be used fifteen exhaust fans, sixty hoods, seven dust collectors and a large quantity of pipe and elbows. They have also received a contract to install a large system for Hubbard & Co., Pittsburgh, Pa., for the removal of dust from eight emery belts and seven large emery wheels.

Frederick T. Snyder, president of the Snyder Electric Furnace Company, 53 West Jackson Boulevard, Chicago, Ill., will deliver an interesting paper before the October meeting of the American Chemical Society in Pittsburgh, Pa. His paper describes an electric furnace for carrying out industrial operations at temperatures above 2,000 degrees C. The furnace is adapted to operate on powdered material and can be built to operate reliably with a holding capacity as large as ten cubic feet of charge. The use of such a furnace renders commercial a number of high temperature reactions which heretofore could not be utilized.

Stamford Rolling Mills Company, of Springdale, Conn., recently purchased the plant formerly operated by the United German Silver Company and are making improvements to the extent of about $50,000, increasing the mill in all its departments. The company has a capital stock of $255,000; preferred $85,000; common $170,000. E. R. Dick, of Dick Bros., bankers, is president; F. W. Blake, general manager; R. A. Wood, superintendent; A. P. Meng, chemist. The company proposes to make quality products exclusively. It has opened a sales office at 25 Broad street, New York.

REMOVALS

The Eclipse Air Brush & Compressor Company has moved from 222 High street to 77 Orange street, Newark, N. J.

The Holtzer-Cabot Electric Company announce that they have moved their offices from Brookline, Mass., 613-621 Albany street, Boston, Mass., and 101 Bristol street, Boston, Mass., to their new offices and factory at Roxbury, Boston, Mass.

ELECTION OF OFFICERS

The Hydraulic Press Manufacturing Company, manufacturers of hydraulic presses, etc., Mount Gilead, Ohio, announce that the officers of that company have been changed to A. Q. Tucker, president; W. C. Beebe, vice-president; Frank B. McMillin, general manager and secretary, and M. W. Spear, treasurer.

INCREASE IN CAPITAL STOCK

The Sterling Machine & Stamping Company, of Wellington, Ohio, has filed papers with the secretary of state increasing its authorized capital from $50,000 to $150,000.

The Splitdorf Electric Company of Newark, has filed with the secretary of state of New Jersey an amendment to its charter which increases the capital stock from $3,500,000 to $4,500,000. The concern manufactures brass carbureters and other like appliances.

The directors of the Billings & Spencer Company have voted to increase the capital stock $300,000, making the entire capitalization $500,000. This increase is required by the company to finance the purchase of and improvements on its new plant at the corner of Laurel and Park streets.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To manufacture brass spark plugs, etc.—The Empire Manufacturing Company, Newark, N. J. Capital, $25,000. Incorporators: J. L. Cobb, F. J. Miles, William P. Murphy, all of Newark.

To manufacture bronze and aluminum castings.—National Bronze and Aluminum Castings Company, Detroit, Mich. Capital, $10,000. Incorporators: P. J. and V. R. Donnelly and Robert L. Pratt.

To manufacture brass and other metal specialties.—The Palmer Specialty Company, Buffalo, N. Y. Capital, $100,000. Incorporators: Wallace G. Palmer, North Tonowanda, N. Y., William Marcy and S. Fay Carr of Buffalo.

To manufacture primers and explosive caps for shrapnel shells.—Hodge-Miller Manufacturing Company, Equitable Building, New York, N. Y. Capital, $200,000. Incorporators: H. D. Hodge, J. H. Miller and L. C. Mitchell.

To manufacture pumps, brass goods and plumbers' supplies.—A. Y. McDonald Manufacturing Company, Dubuque, Iowa. Capital, $750,000. Officers: A. Y. McDonald, president; J. M. McDonald, vice-president; Ira G. Whitney, secretary, and Mary H. McDonald, treasurer. This concern has been in existence for some time and has just lately been incorporated.

FOREIGN TRADE OPPORTUNITIES

For addresses of these enquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file numbers.

Scrap copper, No. 18,418.—A firm in Venezuela requests an American consular officer to furnish names of manufacturers in the United States interested in old and scrap copper.

Copper wire, tubes, bars and sheet copper, No. 18,293.—An American consul in Spain reports that a concern in his district desires to communicate with American manufacturers of copper wire, tubes, bars and sheet copper. Prices and catalogs are requested at once. Correspondence should be in Spanish or French.

Galvanizing.—The Meaker Company, manufacturer of electro galvanizing equipment, Chicago, Ill., have issued a very compact little booklet of twenty pages containing complete information regarding the Meaker methods of automatic and continuous galvanizing processes. Copies of this booklet may be had for the asking.

Aluminum and antimony, No. 18,188.—A manufacturer of tin foil and lead capsules for wine and liquor bottles in Switzerland has informed an American consular officer that he desires to extend his connections to American sources of supply of aluminum and antimony. Correspondence may be in English, but is preferred in German. Quotations are desired c. i. f. French ports. Reference is given.

Antimony, etc., No. 18,170.—A business man in Spain informs an American consular officer that he wishes to receive, as soon as possible, c. i. f. quotations on 2 tons of Japanese sulphur of antimony, 1 ton of commercial potash, 100 kilos of nickle sulphate and ammonia sulphate, 1 to 2 tons of powdered or crystallized borax, and 100 kilos of boric acid. Correspondence should be in Spanish. Quotations should be in gold pesetas or francs. References are given.

Nickelin and plated copper sheet, No. 18,364.—A company in Switzerland engaged in the manufacture and sale of plumbing and sanitary supplies, central heating, etc., has requested an American consular officer to place it in communication with American manufacturers of nickelin and plated copper sheet; that is, copper sheet rolled with nickel (not electro-nickel plated), such as is used in the manufacture of scullery sinks. Correspondence may be in English.

Copper, No. 18,448.—An American consular officer in Switzerland reports that no offers have been received in connection with a bid calling for 200 metric tons of copper articles, the estimated value of which is $77,200. An announcement of this bid was published as Confidential Circular No. 680, and Foreign Trade Opportunity No. 16,829. It is suggested that American manufacturers transmit offers by cable without further delay. If this order can be satisfactorily placed in the United States, with reference to price and quality, it will doubtless lead to more and larger orders.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Power Transmission Machinery.—The Mesta Machine Company, Pittsburgh, Pa., have issued an interesting chart of the horsepower of power transmission machinery. The chart is 6 by 7 inches in size and the company will be pleased to send, upon request, a blue print which is sixteen times as large.

Tinol and Other Solder Products are described in an attractive little booklet just issued by Hess & Son, Philadelphia, Pa. Tinol products are put up in a new form consisting of a collapsible tube which, it is claimed, makes it much more convenient and economical to handle. The booklet also contains full directions for handling Tinol paste, rod and wire.

Hydraulic Presses.—The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, illustrate and describe their new hydraulic projectile presses in Bulletins Nos. 5002-3, the first of which is devoted to a press for the forging and drawing of steel shells and the latter for nosing and banding steel sheels. Copies of these bulletins may be had upon request.

Welding.—"Electric Arc Welding" is the subject of a booklet just issued by the Lincoln Electric Company, Cleveland, Ohio, who are manufacturers of complete electric arc welding plants, etc. The arc welder, which is described in the pamphlet, has, the manufacturers state, a unique feature in that it delivers at the arc at all times only the voltage required by

actual welding work and it uses no resistance for rheostat and circuit with the arc, thus effecting a tremendous saving in the electric current.

Metal Cleaning.—The J. B. Ford Company, manufacturers of chemicals, Wyandotte, Mich., explain in a little folder their reasons for claiming superiority for the Wyandotte metal cleaner. It is said that this metal cleaner may be used with an electrically equipped tank or in the still or dip tank with equally satisfactory results for cleaning metal parts before plating, enameling, galvanizing, japanning, painting, etc. The amounts to be used vary considerably depending upon the nature of the oil, grease, or other matter to be removed, and the temperature, also when electrically equipped, the voltage and amperage of the generator.

Bearings.—"The Use and Abuse of Ball and Roller Bearings." This is the title of a new twenty-page treatise by F. J. Jarosch, chief engineer of the Bearings Company of America. The text gives explanations and experiences which help in the selection, mounting and lubrication of ball and roller bearings in automobile gears and in all other rotating parts and is intended to help in detecting the real cause of trouble. Nineteen drawings are used to illustrate the text matter. Copies of this treatise may be obtained free upon request from the publishers, the Joseph Dixon Crucible Company, Jersey City, N. J.

Metals.—The Taunton-New Bedford Copper Company, Taunton, Mass., of whom W. A. Locke is now resident manager for New York, have issued a new catalog which gives a few changes in methods of listing, as, for instance, in relation to size of copper, the equivalent thickness in inches is given where before ounces per square foot were only noted. Yellow matter has been treated in the same manner. Soldering irons are also illustrated which show the actual article. Equivalents of weights and measures according to United States and Metric system are also given which are valuable in view of the inquiries now coming in from foreign countries. Copies of the catalog may be had upon request.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

NEW YORK, October 4, 1915.

COPPER.

Opening at 17½ cash f. o. b. New York for Electrolytic, the price has gradually advanced to 18 cents, the limit placed by the combination of producers. Business during the month has not been active and there was enough second hand copper and dealers offering to keep the price well under the limit set by the larger producers. The last week in September, with the advance in London, some good domestic orders were placed at 18 cents delivered terms and producers advanced the price to 18¼ cents on the 27th.

It is estimated that production today is from 20 million to 30 million pounds over the combined domestic consumption and exports and from all reports at hand the production is likely to increase.

The exports for the month are small, about 13,000 tons, against 19,000 tons a year ago.

The stocks of copper in England and France are about 6,000 tons more than they were when the war started. The market today is under control of the combination and Electrolytic is quoted at 18¼ delivered terms. Lake is offered at from 18 to 18¼ and casting copper at 17¼ cents.

TIN.

The tin market has held fairly steady and there have been no violent fluctuations. Opening at around 33½ cents, prices declined to 32¼, and with the better feeling in London the last week prices advanced and the market closed 33½ cents.

LEAD.

The price of lead was reduced by the trust from 4.90 at the opening to 4.50 New York basis, the price ruling today. The market is firm and higher prices are expected. The independents are not sellers at the trust price, but are asking 5 points higher.

SPELTER.

The spelter market, after opening at around 15¾ New York, sagged off about 2 cents per pound and later prices advanced to around 14½ cents at the close.

ANTIMONY.

The antimony market has been very dull, the only grades that are quoted are Chinese and Japanese and these are around 28½ cents.

ALUMINUM.

The aluminum market has been quite active and prices have advanced from 6 to 7 cents per pound. The leading maker is quoting 31 cents for 1916 delivery, but cannot guarantee any stated dates. The outside market is very irregular. No. 1 aluminum is quoted around 49 cents and for any quantity 49 to 50 cents would probably have to be paid.

SILVER.

The silver market is rather firmer, opening at around 46½; price today is 49½ New York.

QUICKSILVER.

Market has been very quiet and the wholesale price today is $89 per flask. Smaller lots are quoted from $90 to $100 per flask.

PLATINUM.

The market is firmer owing to smaller shipments from France. Ordinary refined is quoted at $54 and 10 per cent. hard about $58 per ounce.

SHEET METALS.

The price of sheet copper is held about the same price, irrespective of any decline in the price of ingot copper. Prices of sheet today are really based on about a 20-cent copper market. Sheet copper nominal around 23 cents, high sheet brass 27 cents, copper wire 19½ to 19¾.

OLD METALS.

Aluminum scraps have been active, but copper has been dull; prices are higher today on the advance of the ingot metal. Export business is very dull.—J. J. A.

SEPTEMBER MOVEMENTS IN METALS

	Highest.	Lowest.	Closing.
COPPER,			
Lake	18.15	17.50	18.00
Electrolytic	18.15	17.25	18.00
Casing	17.50	16.25	17.25
TIN	33.85	32.25	32.55
LEAD	4.90	4.45	4.55
SPELTER	16.00	13.65	14.55
ANTIMONY (Chinese and Jap)	29.50	29.00	28.35
SILVER	49½	46¼	49½

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

1913—Average for year, 15.83. 1914—Average for year, 13.91. 1915—January, 14⅛. February, 15.25. March, 15.75. April, 18.50. May, 22.50. June, 22.50. July, 22.25. August, 19.50. September, 18.50.

Brass Mill Spelter. 1915—January, 6.55; February, 11.85; March, 12.15. April, 13.85. May, 20.55. June, 25.60. July, 24.90. August, 19.30. September, 17.85.

Metal Prices, October 4, 1915

NEW METALS.

	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	18.00
Electrolytic, carload lots	18.00
Casting, carload lots	17.50
TIN—Duty Free.	
Straits of Malacca, carload lots	32.30
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	4.50
SPELTER—Duty 15%.	
Brass Special	15.25
Prime Western, carload lots, nominal	14.50
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	60.00
100 lb. lots, f. o. b. factory	55.00
Ton lots, f. o. b. factory	50.00
ANTIMONY—Duty free.	
Cookson's cask lots, nominal	....
Hallett's cask lots, nominal	....
Hungarian grade	28.50 to 29.00
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad. valorem. Shot, Plaquettes, Ingots. Blocks according to quantity	48.00 to 50.00
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL	nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	6.00
BISMUTH—Duty free	nominal
CADMIUM—Duty free	nominal 1.90
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	2.00
QUICKSILVER—Duty, 10% per flask of 75 pounds	92.50
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	$50.00 to 54.00
SILVER—Government assay—Duty free	49¾

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% according to quantity	27 to 29
Silicon Copper, 20% " "	31 to 34
Silicon Copper, 30% guaranteed " "	33 to 38
Phosphor Copper, guaranteed 15% " "	23 to 27
Phosphor Copper, guaranteed 10% " "	21½ to 25¼
Manganese Copper, 25% " "	35 to 40
Phosphor Tin, guaranteed 5% " "	58 to 61
Phosphor Tin, no guarantee " "	38 to 41
Brass Ingot, Yellow " "	15⅝ to 17⅝
Brass Ingot, Red " "	15 to 16
Bronze Ingot " "	17 to 18
Manganese Bronze Ingots " "	21 to 22½
Phosphor Bronze " "	18 to 19½
Casting Aluminum Alloys " "	45 to 50

PHOSPHORUS—Duty free.
According to quantity ..... 30 to 35

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
15.00 to 15.50	Heavy Cut Copper	16.50 to 17.00
14.50 to 15.00	Copper Wire	16.00 to 16.50
13.00 to 13.50	Light Copper	14.50 to 15.00
11.75 to 12.25	Heavy Mach. Comp	13.50 to 14.00
10.00 to 10.50	Heavy Brass	12.00 to 12.50
8.25 to 8.75	Light Brass	10.00 to 10.50
11.50 to 12.00	No. 1 Yellow Brass Turnings	13.00 to 13.50
10.50 to 11.00	No. 1 Comp. Turnings	11.50 to 12.00
4.00 to	Heavy Lead	.... to 4.25
10.00 to	Zinc Srap	.... to 11.00
12.00 to 15.00	Scrap Aluminum Turnings	15.00 to 20.00
20.00 to 25.00	Scrap Aluminum, cast alloyed	25.00 to 30.00
25.00 to 30.00	Scrap Aluminum, sheet (new)	30.00 to 35.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
23.00 to 25.00	Old Nickel	23.00 to 25.00

PRICES OF SHEET COPPER

BASE PRICE, 23.00 Cents per Lb. Net.

SIZE OF SHEETS. Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
		Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC— Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	16 cent basis, less 8%
Casks, jobbers' prices	16
Open casks, jobbers' prices	18

Metal Prices, October 4, 1915

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect July 2, 1915

To customers who buy over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.26⅝	$0.26½	$0.26⅞
Wire	.26⅝	.27	.27⅛
Rod	.26⅝	.27	.27⅛
Brazed tubing	.30¾	——	.33½
Open seam tubing	.30¾	——	.33½
Angles and channels	.30¾	——	.33½

To customers who buy 5,000 lbs. or less per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.28½	$0.28½	$0.28⅝
Wire	.28½	.29	.29⅝
Rod	.28⅝	.29	.30
Brazed tubing	.32¼	——	.35½
Open seam tubing	.32¼	——	.35½
Angles and channels	.32¼	——	.35½

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuations in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

19c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	24c. per lb. base
100 lbs. to 300 lbs. in one order	24½c. " " "
Less than 100 lbs. in one order	26c. " " "

PRICES FOR SEAMLESS BRASS AND COPPER TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 32½c. per lb.
Seamless Copper Tubing, 30½c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
40½	39½	34½	33½	32½	32½	32½	32½	32½	32½	32½	33½	34½	36½	38½	39½

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet	
	Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount, 10%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	34c. net base
Muntz or Yellow Metal Sheathing (14" x 48")	30½c. " "
" " " " Rectangular sheets other than Sheathing	32c. " "
" " " " Rod	30½c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 38½c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 4c. over Pig Tin. 50 to 100 lbs. 5c. over, 25 to 50 lbs. 7c. over, less 25 lbs. 8c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Base price down to 16 gauge 70c. per pound.

Gauge.	Width. Inches.	Less than 1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30			
	30-60			
21 to 24 inclusive	30-48			
	48-60			
25 to 26	3-30			
	30-48			
27	3-30			
	30-48			
28	3-30			
	30-48			
29	3-30			
	30-48			
30	3-30			

We are unable to quote these prices, but they can be had upon application to manufacturers and dealers.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. **BASE PRICE, 85 Cents per Pound.**

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.																	
12.	.109.																	
14.	.083.																	
16.	.065.																	
18.	.049.																	
20.	.035.																	
21.	.032.																	
22.	.028.																	
24.	.022.																	

We are unable to quote these prices, but they can be had on application to manufacturers and dealers.

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Price per lb. over 25 lbs., Diameter, B. & S. Gauge, No. 000 to 10 and 12, 60 cents.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	34c.	16%	38c.
8%	35½c.	18%	38½c.
10%	36c.	20%	41c.
12%	37c.	25%	49c.
15%	37½c.	30%	54c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	36c.	15%	42¾c.
8%	38c.	16%	43¼c.
10%	39½c.	18%	45¼c.
12%	41¼c.	30%	60½c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.